SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

THE COLLEGE OF PHYSICAL SCIENCE.

Although during the past 20 years several efforts have been made to afford to students increased facilities for the acquisition of technical knowledge, the success of the schools established, or which it it was sought to establish, for the purpose has not been so great as could be desired. The cause of failure in each case has not been difficult to trace, it is true, but inasmuch as the public look only at results, there is little doubt that every fresh effort has been made under even less favourable circumstances than the previous one; and that, consequently, projects which had they stood entirely alone might have obtained solidity have been persistently neglected, and suffered to sink into oblivion. We trust that the College of Physical Science, in course of establishment at Newcastle-on-Tyne, will not be placed at any disadvantage through being referred to other and less favourably situated establishments, which might be supposed in some degree to resemble it in object or in constitution; for we are convinced that, if carried on with the same liberality and in the same spirit as it has been commenced, it will speedily become one of our most important national institutions.

That the attempt to diffuse high scientific instruction amongst all classes of the community indiscriminately, and without regard to the mental capabilities of the individual, or his social position, is productive of more evil than benefit can scarcely be questioned by any who have given the subject their impartial consideration; and it is precisely because the College of Physical Science will place every facility in the way of those in a position to utilise the knowledge imparted there, without throwing open its doors to all comers, that we should predict for it the speedy attainment of a high position and a long career of great prosperity. An American author of considerable reputation has written that "men are no more born equal than the tubers in a bushel of potatoes," which is doubtless true, although each man in his particular position may be better fitted for the special duties he has to perform than men of any other class above or beneath him in the social scale; so that it is as absurd for the director of a chemical works to suppose that he could replace a common workman in the establishment of a manufacturing chemist, as for that workman to suppose that if all workmen were instructed in science such an officer would be unnecessary, and workmen's wages would, consequently, be materially higher.

Amongst the advantages possessed by the College of Physical Science to which no similar institution, in embryo, in existence or defunct, could lay claim, its position may be most prominently mentioned; in this respect it could scarcely be surpassed. Not only is it in the immediate vicinity of collieries and metalliferous mines, and surrounded by industrial establishments of considerable extent, but it is within easy reach of all the great manufacturing districts in the kingdom, so that the students will have every opportunity for acquiring a knowledge of the practical details connected with the branches of industry to which they intend to devote themselves, whilst studying the scientific principles connected with them, and likely to be of service to superior officers entrusted with the direction of them. Moreover, from the very constitution of the college each student will be compelled to become, to a certain extent, proficient in general scientific knowledge, and will thus be fitted to occupy a position in allied branches of industry, although he may not have specially studied for them. It is obvious that this would not be the case with the students in those establishments professing to enable each individual to acquire exactly the quantity and kind of knowledge required in some particular trade and no more; but since the College of Physical Science aims only at providing the higher class of instruction required by managers and directors of works, it is not likely that the operations of the inferior class of school will be interfered with.

As it has been determined to attach good stipends to each professorial chair, it is not surprising that the applications for the professorships should have been numerous, and that the list of candidates should include men of the greatest ability in their respective departments, so that when the result of the appointments to be made on June 30 is known there will no doubt be reason to congratulate the executive upon the possession of such a professional staff as shall command the attendance of a large number of students. The College will be opened immediately after the summer vacation, before which it is confidently anticipated that the whole of the 35,000*l.* estimated to be required will be raised, upwards of 22,000*l.* having already been promised. The liberality of the North of England Institute of Mining Engineers in placing their hall at the disposal of the new college cannot be too highly appreciated, as it will contribute still further to enable all available resources to be applied to the maintenance of the college in an active position until it shall have had time to become firmly established; and from the connection that will exist between the college and the University of Durham, many owners and managers of industrial undertakings will, no doubt, determine to place their sons at Newcastle, and thus secure them a sound technical education, whilst studying for a university degree, instead of sending them to Oxford or Cambridge, as has often been the custom hitherto. The college may, therefore, contribute as much to the prosperity of the university as the university has contributed to the successful establishment of the college, and Englishmen may at last be able to boast that the highest class of technical instruction is obtainable at home more readily than in any other country.

Although the college will owe its existence entirely to local energy, aided by the hearty co-operation of the University of Durham, it may be hoped that the importance of the college as a national institution will at once be recognised, and that a large proportion of the 10,000*l.* or 15,000*l.* still remaining to be raised will be contributed from all parts of the United Kingdom. The time between this and October is not long, but if the matter be taken up heartily by but one in ten of those who would derive advantages from employing students of the college the required amount would be obtained at once. The institution, it should be remembered, will combine all the advantages that could be desired in a school of mines (not placed in a capital within 50 miles of which no mines exist), and in a school of arts and manufactures constituted upon the most liberal bases, and attached to a university of fair reputation; so that it may be anticipated that the students who distinguish themselves in it will be well fitted to assume the direction or management of any industrial undertaking with which they may be entrusted.

We shall take another opportunity of giving more complete details of the courses of study that will be pursued.

THE AVONSIDE ENGINE WORKS, BRISTOL.

The largest works in connection with the finished iron trade in the West of England are those of the Avonside Engine Company, at Bristol, where upwards of 1000 hands are employed. They are situate close to the river Avon, having a wharf or landing-place by their side, where lighters and other vessels discharge coal, &c., and are also close to the Midland Railway. They have long been known throughout the United Kingdom, having for a considerable period been successfully carried on by Messrs. Slaughter and Co., previous to having been taken by the present company. A reputation second to none in the trade for the production of locomotive, marine, and other engines, has ensured for the company an amount of patronage that has kept their workpeople constantly busy, and at the present time there is the greatest activity in all branches, so much so that the only complaint appeared to be the shortness of hands.

The offices, by which the works can be entered, are handsomely fitted up, and the whole of the buildings, which cover a large area of ground, are extensive, lofty, well lighted, and fitted up with powerful machinery, and the most approved appliances required for such a vast establishment. The erecting-shop is a well appointed building, having four lathes, nine drilling machines, a screwing machine, with powerful movable cranes. There has recently been turned out several double-screwed engines for war vessels for the English Government, as well as twenty large locomotives for India, for the Oude and Rohilcund Railway, and some for the Carnatic Railway also. A considerable number, in various stages, were on the stocks for the Continent, Wales, and more distant countries. In the moulding-shed nearly 30 moulders are employed, as the company make all their own castings, or nearly so. In it there are three cupolas, with a 20-horse power engine for the foundry and the sand mills. The castings made are up to 18 tons. In the pattern and joiners' shops nearly 40 men are engaged. In the former the models include everything in the shape of marine, locomotive, and other engines, as well as other descriptions of work. The smiths' place is a large one, and well arranged; there are in it about 70 fires, with eight steam-hammers, ranging in power from 10 cwts. to 3 tons. Four coke-ovens are kept constantly in use for the smiths, and there are also eight heating or steam-hammer furnaces, with engines and upright boilers, 40 ft. long by 6 ft. in diameter. The boiler-shop, where there appeared to be the greatest activity, contained a great quantity of powerful machinery. In it there were three plating-furnaces, two engines, a 20-horse power and 15-horse power, with ordinary boilers. The appliances, &c., included 12 smiths' fires, several rivetting machines, eight shearing and punching machines, 18 drilling machines, &c. Several of the machines were by Sharp, Whitworth, and Craven, of Manchester. In it also were some of Ramsbottom's self-acting cranes, lifting upwards of 20 tons.

In the marine shop were several important finished and unfinished engineering works. That which is evidently the most valuable was a patent disintegrator for a flour mill; it is the invention of Mr. Carr, of Bristol, and as each of the machines brings in a royalty of 1500*l.* a year, as stated by the manager, and as they are being adopted, not only in England and Scotland, but also on the Continent, America, &c., Mr. Carr is evidently on the highway not only to fame but to a colossal income. The machine itself is of a peculiar character, and looks like a series of large circular cages, one inside the other. The corn, it appears, goes from a hopper, and then passes through 15 cages, revolving in different directions, and making about 800 revolutions each way per minute. The cages are about 7 ft. in diameter, and there are about 1000 steel pins in each. The machine, it is calculated, will do the same work as 30 pairs of stones, so that the saving appears to be something immense in every way, and no doubt it will be well supported by millers when its advantages are generally known. In the same place is a heavy double-swing bridge for the Cumberland Basin, Bristol, and will be put down alongside of the place where the dock-gate fell a week or two since, and killed eight men. The machinery in the department comprised engines of 100-horse power, with suitable boilers of the ordinary type. There was also one of the finest slotting machines in England for slotting frames for engines, by Smith, Peacock, and Tannatt, together with a number of heavy lathes, shaping, drilling, and slotting machines, by Sharp, Whitworth, and Co., and other makers, as well as two of Ramsbottom's powerful steam cranes. For planing the metal there are three machines capable of plaining 20 ft. in length and 12 ft. square. The fitting shop is a large one, and is replete with every essential for that important branch of engineering, there being in it something like 200 machines of various descriptions, such as slotting, shaping, drilling, turning, and various other appliances.

Every department appears to be separate from the other, an arrangement that is always advantageous where large bodies of men are engaged in different branches of even the same profession. The brass shop at the Avon Works is a separate room, fitted up with lathes, and the necessary tools and requirements. To leave nothing to be desired, gas is also made on the premises, the consumption of coal, some of which comes in barges from South Wales, being about 1500 tons a month.

The company appears to be in a highly prosperous state, with very large orders in hand, and in expectation of receiving some heavy contracts for marine and other engines. The Chairman is the late leading proprietor, Mr. Slaughter, and who is, consequently, well acquainted with the business over which he presides. The chief engineer is Mr. Sacré, a gentleman proverbial for his courtesy, formerly connected with the Great Northern Railway, and afterwards with the Yorkshire Engine Works, near Sheffield. In conclusion, we may say that the works will well repay a visit to them, more especially to those interested in the iron or engineering businesses.

Applying Heat to Boilers.—By the invention of Mr. B. D. Healey, Glasgow, combustible gas is used, such as that commonly known as carbonic oxide, which may be produced in well-known ways in producers of various forms adapted to the nature of the fuel being used. The air to support the combustion of gas is passed through one or more series of fire-clay or other pipes, which are arranged on each side flue of the boiler seating, and which regenerate the otherwise waste heat passing to the chimney. These air-pipes are laid horizontally, and in direct lines from the back to the front end of the boiler, and are carried by transverse brick partitions, which act as bafflers, and cause the free gases to impinge repeatedly on the boiler sides and air-pipes.

BIRMINGHAM AND THE BLACK COUNTRY—No. XIII.

THE WORKS OF MESSRS. JOHN JONES AND SONS.

Messrs. John Jones and Sons direct their attention principally to the manufacture of pig-iron and coke, and have in operation the Green Lane Furnaces, Walsall, the Buffery Furnace, Dudley, and the Bullfield Coke Furnaces, Dudley. The Messrs. Jones purchase all their raw material, and to be able to successfully compete with the general furnace proprietors of the Black Country, who are mostly coal and mine owners, they have to work with great economy; consequently, they have adopted all the most approved modern appliances, and for smelting the mine used, and considering the quality of pig produced, the furnaces are equal to any in the district, and superior to the majority. The firm do not attempt to make iron of the best quality, but yet they make a very fair pig, which is largely used in some of the principal forges and foundries hereabout.

The Green Lane Furnaces are situated about a mile from the town of Walsall, and here the firm trade under the cognomen of the Walsall Iron Company. There are two circular brick blast-furnaces, 51 feet and 52 feet high, by 14 feet diameter in the boshes. They are built of red bricks, lined with white, and bound by wrought-iron straps or rings. Each furnace has six ordinary tuyeres, through which the blast is supplied. The raw material is conveyed to the top of the furnaces by means of a pneumatic lift, operated upon by the blast, and constructed in the following manner:—Two cylindrical tubes of different diameters, made of boiler-plates, are placed one inside the other, and the intervening space filled up with water. At the top of the inner tube there is a square platform, having attached to it slides working between four upright cast-iron columns, which run from the ground to the top of the furnace. Four chains pass from the platform up the columns, over pulleys fixed at the top, and have heavy balance-weights hanging at their other ends. The blast, on being introduced into the inner tube, by its pressure raises it and the platform; the latter descends when the blast is released. The blast is produced by a large beam-engine, having the blowing-tub under the steam cylinder at one end of the beam, and a large 20-ton fly-wheel, worked by connecting-rod and crank, at the other. The steam cylinder is 50 inches diameter, the blowing-tub 96 inches diameter, and the stroke 8 feet. The beam is supported in the centre on two cast-iron columns, and girders built into the engine-house wall. The valves are of that class termed Cornish, and derive their motion from the fly-wheel shaft, by means of gearing-wheels and a shaft fitted with cams. The quantity of blast supplied is a pressure of nearly 4 lbs. to the square inch. Steam for the engine is generated in five cylindrical egg-ended boilers, three 40 ft. long and two 38 ft. long, each 8 feet diameter. These boilers, as well as the hot-air ovens, are heated by the gas taken off from the tops of the furnaces. To No. 1 furnace there is a large oblong hot-air oven, containing 30 syphon-pipes, 10 inches by 4 inches in the bore, and to No. 2 there is one oven the same size as that to No. 1, and a circular oven containing 24 pipes 4½ inches diameter. The temperature of the blast at the tuyeres averages 1200°. The blast is conveyed from the engine to the ovens through a 5-ft. diameter wrought-iron main, supported upon cast-iron columns. The connections from the ovens to the furnaces were formerly cast-iron and under ground, but they are now being substituted by pipes of wrought-iron lined with bricks placed over head, where they are more easily repaired in case of leakage.

The gas is taken from the tops of the furnaces, through brick flues which surround them. The openings into the flues from the interiors of the furnaces are made to slant inwardly, so that the rubbish carried out by the gas cannot rest in them, but rolls back into the furnaces. This plan does away with the necessity for cleaning out the flues so often, which is a troublesome operation. The gas from No. 1 furnace is taken from the flue which surrounds the furnace through a brick flue, 4 ft. 6 in. square, to a 5 ft. diameter wrought-iron tube passing along the front of the boilers. A wrought-iron tube connects No. 2 furnace with the downward brick flue. For each of the hot-air ovens the Messrs. Jones have a separate flue from that surrounding the furnace, and do not in the usual way connect the oven flue with the main one going to the boilers, as they find their plan answers best; the same thing is done at most of the blast-furnaces in Belgium. Enough gas is furnished by the two furnaces to heat the whole of the boilers and hot-air ovens. The action of the gas is as perfect here as we have yet seen it, the only portion of the apparatus which we could in the least object to is the brick descending flue, but Messrs. Jones built this at a time when utilising the waste gas was a new thing to South Staffordshire; and at their other furnace they have a wrought-iron tube. The difficulty with the brick flues is to keep them tight, and prevent the gas from firing, but at these furnaces they are plastered or washed with a composition of lime and sand, and there is little or no trouble with them. The stack for drawing off the gas is built of red and white bricks, having rods terminating in washers, passing through it at intervals, and is 140 ft. high by 8 ft. 6 in. square inside, from top or bottom. There are offices, and several shops and other necessary buildings surrounding the furnaces. The blast-engine house is a massive brick building surmounted by a large tank, from whence the water runs to the tuyeres, &c. The canal runs on two sides of the furnaces, so that there is plenty of wharfage, the railway also will shortly be laid into the works. Near to the furnaces there is a large coke hearth, on which the Messrs. Jones convert coal into coke, to be used in the furnaces, and here they are carrying on a very interesting process, for instead of allowing the products of combustion to escape from the centre of the coke fires, as is the case at every other place in the district, they are collecting them, and the result is they have a quantity of paraffin oil and ammoniacal liquor. The gas from the fires is conveyed underground through condensing tubes, and the oil and liquor deposited in a cistern, from whence it is pumped to a large tank, where the liquor is drawn off from the top of the oil by syphons into a separate vessel; they are then both ready for use. The oil is sold at the low price of 8d. per gallon for lubricating purposes, and answers admirably. The liquor is sent to the chemical works, and when tested by Twaddle's hydrometer shows a density of 4°. This process is the patented invention of a relative of the Messrs. Jones, and is styled Jones's patent open fire coking process. The Blox-

wich 5 feet coal is at present used, and from 5 to 6 cwts. of oil and 2 tons of liquor are produced from one fire composed of 20 tons of coal.

The Buffery Furnace Plant is distant about one mile from the town of Dudley. The furnace here is similar in construction to those at Walsall, and is 50 ft. high by 15 ft. diameter in the boshes. There are three hot-air ovens to this furnace, two long ones, the first containing 30 and the second 26 syphon-pipes, 4 in. in diameter. The third is a circular oven, having 10 large twin round pipes 12 in. in diameter. This latter oven is only just completed, and is so constructed that the gas which heats it, instead of passing in at the bottom and out at the top, comes in at the bottom, and by a very ingenious arrangement is made to pass round the pipes and out again at the bottom; by this means it is supposed a greater amount of heat will be derived from the gas. The blast-engine is of the condensing beam class, having the steam cylinder 38 in. in diameter at one end of the beam, and the blowing tube 84 in. in diameter at the other, and a stroke of 5 ft. 10 in. The pressure of blast produced is 4½ lbs. to the square inch. Steam for the blast-engine is derived from two cylindrical boilers 25 ft. long by 7 ft. in diameter, one 25 ft. long by 6 ft. diameter, and another 42 ft. long by 6 ft. 6 in. in diameter. The gas is taken from the furnace by the same plan as that adopted at Walsall, with the exception that the flue surrounding the furnace is cased with wrought-iron, and instead of there being a brick descending flue, as before stated, it is here composed of wrought iron, is 5 ft. in diameter, and joins a horizontal tube of the same size passing along the front of the boilers. The ovens are each supplied with gas by a separate tube. The stack drawing off the gases is 140 ft. high by 7 ft. 6 in. square inside. The material is drawn to the top of the furnace, up a timber incline, supported upon brick pillars, by a small vertical high-pressure beam-engine, having a cylinder 9¼ in. in diameter, and a stroke of 3 ft.; the boilers are cylindrical, one being 20 ft. long by 4 ft. 3 in. in diameter, and the other 17 ft. long by 4 ft. in diameter. The canal runs alongside these works, and a railway, it is expected, will shortly be laid into them. Each of Messrs. Jones's furnaces produce about 150 tons per week. The Bullfield Coke Furnaces are near the Buffery Furnace, and here, from the small slack of the district, which is often thrown away, a first-class coke is manufactured by a patent process. The slack or small coal is ground to almost a powder in a mill, and after being mixed with a certain proportion of bitumen is placed in ovens specially constructed, and burnt into large solid cokes. A small horizontal engine and boiler drives the mill.

The Messrs. Jones smelt in their blast furnaces the tap and flue cinders from the ironworks, the argillaceous iron ores of the district, and the Northamptonshire brown hematite. This latter ore was formerly rather despised in South Staffordshire, but as the native ironstone began to get scarcer the ironmasters discovered the value of it, and thousands of tons are weekly brought into the Black Country. The discovery of this ore is mainly to be attributed to the late Mr. S. H. Blackwell, of Dudley, who was an exceedingly clever and respected ironmaster. The following brief account is taken from Dr. Percy's celebrated work :—"The introduction of the Northamptonshire ore is only of recent date. Not long previous to the International Exhibition of 1851, Colonel (now General) Arbuthnot called upon me in Birmingham, where I then resided, and requested my opinion on a specimen of the ore which he left with me. I found it to contain a sensible quantity of sesquioxide of iron, and a very large amount of siliceous sand. I made no quantitative examination of it, and, certainly, the specimen in question did not prepossess me in its favour. I referred the colonel to my friend Mr. S. H. Blackwell, of Dudley, who visited the locality of the ore in order to examine it *in situ*. He obtained samples much richer in iron than that which was placed in my hands. He prosecuted enquiries on the subject with his usual energy, and the result has been the discovery of an extensive deposit of ore, which has since been smelted in large quantities in South Staffordshire, Derbyshire, and South Wales." The following is the analyses of a specimen from Wellingborough:—

Sesquioxide of Iron	52·20
Protoxide of Iron	Trace.
Protoxide of manganese	0·51
Alumina	7·13
Lime	7·13
Magnesia	0·57
Potash	—
Silica	1·60
Carbonic acid	4·92
Phosphoric acid	1·26
Sulphuric acid	—
Bisulphide of Iron	0·03
Water .... {Hygroscopic	—
Water .... {Combined	11·37
Organic matter	—
Ignited insoluble residue	13·55=100·27
Ignited insoluble residue—	
Silica	11·56
Alumina	0·26
Sesquioxide of iron	0·66
Lime	0·33
Magnesia	0·11
Potash	— =12·92
Iron, total amount	37·00

The ore consists essentially of earthy hydrated sesquioxide of iron. It is oolitic in structure and ochre-brown in colour. The insoluble residue consisted almost entirely of siliceous oolitic concretions, but on dissolving these in potash a small amount of residue was left, containing quartzose sand, scales of mica, and minute spherical particles of magnetic oxide of iron. The ore contained numerous marine shells, and occurs in the Northampton sand, which lies at the base of the Great Oolite, and is the geological equivalent of the Stonesfield slate. A trace of copper was detected in a solution of 660 grs. of the ore.

TESTIMONIAL TO MR. P. COOPER, OF THE HOLMES COLLIERY, NEAR ROTHERHAM.

On the retirement of Mr. P. Cooper, after nine years service, from the management of the Holmes Colliery, near Rotherham, the good feeling existing between him and the employees took the shape of a dinner and presentation, on Saturday evening, at the Ship Hotel, Rotherham, when about 70 sat down to dinner.

The chair was occupied by Mr. Stubbs, and the vice-chair by Mr. Evans. An excellent dinner having received ample justice, and the usual loyal toasts duly honoured, the CHAIRMAN, in calling upon Mr. S. Hall to make the presentation, said—Our business here to-night is a very pleasing one—to render honour to whom honour is due, and to present to our late master and valued friend, Mr. Cooper, a memento of our respect and esteem on his leaving the management of the Holmes Colliery to take the management of a very important and extensive colliery undertaking in the North of England. Mr. Cooper is a gentleman of well-known merit, and as a thoroughly practical mining engineer stands second to none in the coal trade. Whilst he has been here he has had some very great mining and engineering difficulties to contend with, which to the unpractised eye seemed almost unsurmountable, but by his well-known determined perseverance and skill he has overcome them all. He has during the last 3½ years made an entire new pit to the dip of the coal field, capable of and producing 200,000 tons of coal per annum. He has also applied the pneumatic principle to the underground haulage of coal and pumping water, which principle, though not the first application of it to those purposes, he has so improved upon that it may almost be regarded as the first successful one of any importance. This being essentially a workmen's testimonial, I am proud to say they have given an additional proof of their respect by choosing one of their own body to further honour Mr. Cooper by presenting it to him. I have, therefore, much pleasure in calling upon Mr. S. Hall to make the presentation.

Mr. SAMUEL HALL said—I accept the duty you have assigned me with pleasure and reluctance; with pleasure because I am thought worthy to discharge this important duty, with reluctance because there are those present who could have done it more efficiently than myself. Yet as it is your wish I cheerfully perform the duty allotted to me. Permit me, dear Sir, on behalf of the subscribers to present you with this testimonial as a mark of the high esteem which we entertain for your abilities, and in recognition of the uniform kindness and courtesy manifested to us while under your control. And allow me to say that we are actuated by no other motive than that of awarding honour to whom honour is due, and sincerely hope that, whilst we regret losing your presence and advice, those amongst whom you sojourn may fully realise the same kindness and consideration which we have experienced whilst under your control. Believe me, dear Sir, these are the sincere motives which prompt us in presenting you with this tangible evidence of our esteem. Accept it not so much for its intrinsic value, but as the spontaneous emotions of those who believe in gratitude to benefactors and friends. I, therefore, most cordially present you with this sterling silver salver and tea urn on behalf of myself and fellow-subscribers. Allow me also to have the pleasure of presenting to Mrs. Cooper, through you, this time-piece, not only as a token of our respect for her, but we feel assured that a man leading the active and energetic life, and attaining such eminence in his profession as you have done, must have had a large share of home comforts to soothe the cares and difficulties that you have had to contend with while among us. I have now to ask you all to join me in drinking long life, health, and happiness to Mr. and Mrs. Cooper, and may God preserve them.

Mr. COOPER, in reply, said: It is now nearly nine years since I took charge of the Holmes Colliery, and I must say that I certainly thought that my conduct among you had been such as to cause feelings of confidence, esteem, and respect, but I never expected to receive such a handsome testimonial at your hands. There is no doubt that from time to time we have had to discuss important questions, affecting both employers and employed; but I am proud to say they have always been dealt with in a different manner than I am sorry to say has frequently been the case in other parts of the country, and in the end have been settled feelingly and fair. I am perfectly satisfied that but for the extreme forbearance on the part of the workmen we should have drifted into considerable differences. I am gratified to find that it has given satisfaction to the workmen themselves. I have always endeavoured to deal with them with kindness, honesty, and forbearance, and am glad to say it has enabled us to work harmoniously together, with the exception of one little strike—[A Voice: "A very little one."] (laughter)—during the whole of my connection with you. I hope in the future there will be fewer differences, but I must impress upon you not to be too exacting: take time to reason and consider any question which may arise, and I have no doubt the same results will follow in the future as in the past. I certainly cannot speak too highly of the workmen. I have been glad to learn that the officials have joined in this testimonial. I must say I never knew a colliery where the officials have striven to do, and have done, their duty better than at the one I have just left, and I most heartily thank them for their support. I feel deep regret at our separation. I feel on leaving you as though I am going from, instead of to, home, having spent so many happy years amongst you, years of mutual confidence; better I certainly do not expect in the future, but shall be well satisfied if I can preserve such feelings among those to whom I am going. I am quite sure that both workmen and officials have every right to be proud of serving the Rotherham, Masborough, and Holmes Coal Company, where I have certainly had every confidence reposed in me; and I am sure the directors have always exercised the greatest consideration, not only in matters pertaining to myself, but in all things affecting the well-being of their employees. There have been many mining difficulties to contend with, but by the hearty co-operation of all they have been overcome; and I do not hesitate to say, without the slightest thought of boasting, that your pit is not excelled in any part of the world. I may add that many mining and other engineers have seen it, and, without one exception, declared that its arrangements are not equalled in this country; and I certainly do not think such a satisfactory state could have been arrived at except for the constant attention and perseverance of both workmen and officials. I thank you most heartily for the beautiful testimonial, which I shall always look upon with feelings of emotion which words would not adequately express; and in presenting your gift to Mrs. Cooper I shall tell her of the kind wishes you have expressed towards us. I hope that each of you will meet with thorough success in your different spheres, but we must always bear in mind that results depend upon ourselves.

A number of complimentary toasts occupied the remainder of a very enjoyable evening.

PUDDLING-FURNACE BOILERS.

SIR,—In reply to Mr. Macpherson's letter in the Supplement to last week's *Mining Journal*, I can state that the practical result of raising steam in boilers attached to puddling or mill-furnaces is that the heat which in the furnaces with plain brick stacks is wasted is now generally utilised in the Cleveland district for heating that form known as stack-boilers, without the consumption of any more fuel in the latter case, and in certain boilers the consumption is considerably less. This will be readily understood, and the construction of the boilers also, if the articles on the Britannia Ironworks and the Newport Rolling-mills, near Middlesborough, are carefully read. These articles have appeared in the Journal within the last month.

The stack-boilers are constructed sometimes with two, but more commonly now with only one vertical flue in each. Where two flues are used the heat from two furnaces is utilised, one furnace being in connection with each vertical flue, so that the two furnaces are independent of one another in regard to the working of the iron.

Four of the double-flued stack-boilers may be equal to an ordinary 40-horse boiler fired by coal. But stack-boilers, if properly managed, are more than capable of raising steam for both forge and mill-engines. They are likewise the most safe form of furnace boiler yet introduced.

A form of furnace boiler—usually called the balloon boiler, probably from its tendency to explode—is extensively adopted in Staffordshire and other districts. This is usually heated from four puddling or mill furnaces. It economises by using the waste heat, but has proved to be a dangerous description of boiler. C. V.

June 14.

VENTILATION OF MINES.

SIR,—My attention has been directed to some remarks made by Mr. George Elliot, M.P., the hon. member for North Durham, on the occasion of starting a new fan for the ventilation of Usworth Colliery, in place of the furnace which had previously been employed. These remarks are of a very startling character; for the hon. member is reported to have said that he thought no "injustice would be done to coalowners if it were stipulated that henceforth there should be neither furnaces nor steam boilers used in pits." The hon. gentleman does not appear to make any exception to this assertion, whatever the depth of a shaft or its area may be, whether a larger or smaller quantity of gas may be met with in the mine, or indeed whatever the circumstances may happen to be, no power other than a fan ought to be used henceforth for the ventilation of mines.

We are not informed as to the construction of the furnaces previously used at Usworth, nor in Wales, to which latter district the hon. gentleman also refers as a district where fans were "the most necessary," nor are we informed of the current of air produced by the respective furnaces, nor are any particulars given to enable those interested in mining to form an opinion whether or not ventilating furnaces should "henceforth cease to be employed." We may assume that all civil engineers are equally as desirous as the hon. member to adopt every improvement to save the miners' lives. An efficiently ventilated mine, whether that operation be effected by means of a furnace or a fan, in my opinion in immaterial. If a mine be inefficiently ventilated in consequence of the ill construction of the furnaces, then a recourse to a fan with splendid engines, boilers, &c., and of immense power, though in this case an improvement, is no argument whatever against furnace ventilation, for you contrast the best ventilating arrangements obtainable by a fan with the power that could be derived from faulty furnace arrangements; therefore, unless it be clearly proved that furnaces of the most improved plan fail to produce an amount of ventilation equal to the requirements of a mine, it appears to me that furnaces ought not to be prohibited.

In illustration of these points, I may mention that in the year 1865 I designed for Eldon Colliery a pair of underground furnaces, with a large receiver for the heated air, for ventilating the mines. On August 6, 1869, I communicated to the newspapers the particulars of some experiments made with these furnaces, showing a maximum quantity of air circulating through the mine of 255,540 cubic feet per minute, as ascertained by an anemometer. This, I believe, was then, far beyond the performance of any other furnaces, or any other mode of ventilation. In the ordinary rate of working these furnaces, the quantity of air passed through the mine amounts to about 200,000 cubic feet per minute, and with such a current, or very much less, I believe that an explosion at a furnace is impossible."

With respect to the experiments before alluded to at Usworth Colliery, it appears that, with a fan of 45 feet diameter, caused to revolve 40 times per minute, the volume of air was 140,000 cubic feet per minute; this I assume is the ordinary volume of air produced by these engines, boilers, and fan. We, therefore, find that even with a fan, the periphery of which is stated to be revolving at the immense speed of 5655 feet per minute, or upwards of 60 miles an hour, a result is only obtained of 140,000 cubic feet of air per minute, being about 60,000 cubic feet per minute less than is ordinarily obtained by the furnaces before mentioned. In my opinion, until further and minute experiments are made, in order to show the results of the two plans at present in use—the furnace and the fan—it would be rash to arrive at any conclusion, or to attempt to legislate further on this most important subject. Meanwhile it becomes necessary to remove an impression which, from the remarks of a gentleman occupying so important a position, might be produced in the minds of the public—that it is unsafe to ventilate a mine by furnace power. JOHN JOHNSON, C.E., M. Inst. C.E., F.G.S., &c.

Chilton Hall, Ferryhill, June 3.

THE POLLUTION OF RIVERS.

SIR,—We have perused with great interest the article in last week's Journal on the Pollution of Rivers, as well as the letter in the Supplement of your correspondent Mr. Alexander Bassett, C.E., Cardiff.

The subject is most important, and one that demands serious attention. Far be it from us to undervalue the benefit to be derived from sewage as a manure; the only thing now for the authorities to decide is whether it will produce the greatest results at the least possible cost, distributed over the land in a liquid and untreated state, or in a dry condition after precipitation.

We must, however, take some exception to the remarks of your correspondent with reference to results obtained from sewage irrigation at Edinburgh, Croydon, Warwick, &c. We have friends at Edinburgh who admit that in the neighbourhood of the irrigated land there is a decidedly unpleasant odour. Regarding Croydon, we have seen evidence printed as to the offensive state of the "farms" there, and it stands to reason that land which has been saturated with sewage for several years must be very foul, and in hot seasons most pestilential. Has Mr. Bassett ever enquired into the pecuniary results at Croydon? If not, we can inform him that they have spent about 82,000*l.* on sewage irrigation works, not including any purchases of land, at a cost to the ratepayers of some 7000*l.* per annum.

Mr. Bassett says—"The precipitation process called the A B C system I saw last year in full operation at Leamington. This has since been abandoned, and the whole of the sewage water of that town is now taken by Lord Warwick, who pays an annual rent for it, and applies it to his lands in the immediate neighbourhood of the town." The A B C process of the Native Guano Company has not been abandoned at Leamington; on the contrary, the Local Board of Health there have requested the A B C Company to continue their process there for a few months longer, as their sewers are not completed for the conveyance of the sewage to Lord Warwick's land, an arrangement made before the Native Guano Company started at Leamington. It has, therefore, not been abandoned there.

As to the sewage farm at Warwick, we give the following extract from the manager's (Mr. Pritchard) report:—"The quantity of sewage put on every acre of the farm per annum is about 8434 tons, which is equal to 6·6 tons of the best Peruvian guano." He admits this to be a large quantity, and we understand the operations are being carried on at a considerable loss.

At Hastings the A B C process is in active operation, and making large profits. At Bolton and Leeds the works are almost complete. At Southampton works are being commenced, and in a short time the company's works at Crossness will be opened, and we may add that negociations are in a forward state with other important inland and coast towns. JOHN ANDERSON AND SONS.

South Sea House, Threadneedle-street, June 13.

UTILISATION OF SEWAGE BY PRECIPITATION.

SIR,—Under the heading "The Pollution of Rivers," your correspondent, Mr. Alexander Bassett, writes in the Supplement to last week's Journal, "The precipitation process called the A B C system I saw last year in full operation at Leamington. This has since been abandoned, and the whole of the sewage water of that town is now taken by Lord Warwick, who pays an annual rent for it, and applies it to his lands in the immediate neighbourhood of the town." Will you, therefore, permit me to reply to Mr. Bassett that the latter portion of the above paragraph is not in accordance with the facts. The A B C process is still in complete and successful operation at Leamington. It is true that after a further short period of working the sewage of that town will be taken by Lord Warwick, and disposed of at his lordship's discretion, but such is not in consequence of the A B C process having been tried and subsequently abandoned, as might be inferred from your correspondent's letter, but in consequence of an agreement entered into between the town and Lord Warwick prior to the use of the A B C process being adopted at Leamington.

The A B C process is also now being successfully worked at Hastings, where I have recently had the opportunity of inspecting the works. As a fact, the local company have a local demand for the manure obtained by the precipitation largely in excess of the quantity they are able to supply, and which they are selling at 3*l.* 10*s.* per ton, packed in 2-cwts. bags, leaving a large profit on the working cost of the process. I am also informed that other works upon the same principle will be ready to commence working in course of a few weeks at Leeds, Bolton, and Crossness (London), and that the erection of similar works have already been commenced at Southampton. All, therefore, who are interested in the highly important sanitary question of how best to dispose of the sewage of large towns will have the opportunity within a very brief period of seeing the A B C process fairly and completely tested in different localities, and will be able to judge of the value of the process by actual working results. I confess that personally I do not like the idea of disposing of large quantities of sewage by spreading it over a large area of surface, and to growing crops by irrigation. We are told that sewage contains the living germs of a number of parasites to which all animals (including the human species) are more or less liable. It may be possible to destroy these germs, *in transitu*, by means of the precipitation process, but the irrigation process I am afraid must have just the opposite result, and a very unpleasant result it is to contemplate. J. G. BARRY.

8, *Old Jewry, London, June* 14.

THE TRANSIT OF NITRO-GLYCERINE COMPOUNDS.

SIR,—When the last Nitro-Glycerine Act, for there had been one before, was proposed it was done under very exciting circumstances, arising out of a fresh accident with that agent at or near Llanberis in May, 1869; but, like everything else that is done in haste or without due consideration, it was done badly—yea, I may even go further, and say spitefully, for, according to all accounts, it was initiated and fostered by gun-cotton interests. So nobody cared to investigate the true causes of the accident, which are now so well known—indeed, they were known even before the passing of the Act, but the House, or rather Parliament, would not in its then panic-stricken state (for it was the fag-end of the session, and not much time to be lost) listen to any practical advice or information, being, in a manner of speaking, bent on the suppression, at any rate for a time, of this highly useful blasting agent. There is no doubt these frequent accidents were of a so very alarming and serious a nature as to fully justify Parliament in providing against their recurrence by some sort of law, and had it been confined simply to the prohibition of the transport by rail or ship of nitro-glycerine in its pure and simple state, there would have been much wisdom shown, for unquestionably the danger arose from its fluidity; but when

solidified by absorption into certain porous substances, as exemplified by dynamite, the Horsley blasting-powder, and more recently by the experiments with the lithofracteur, it is not more dangerous than gunpowder, ordinary care being used in packing, storing, or transit; that we may now fairly congratulate ourselves on having had sufficient light thrown upon the subject, as far as the general safety of the public is concerned, and need be no longer under the feverish state of anxiety that necessitated this Bill, which really presses very hard upon the scientific, mining, and commercial interests, and therefore, in my opinion, Parliament would only be showing its good sense in appreciating the meritorious exertions of those daring chemical spirits who have investigated the matter for the benefit of society by at once removing all those harsh restrictions which operate so injuriously, being perfectly satisfied of their safety; and, but for the unfortunate circumstance of Mr. Nobel sending it out at first in a fluid state, we should, in all probability, have never heard of such accidents, for, as Mr. Webb has justly observed, tons of dynamite have been shipped abroad, and safely carried long distances inland, over rugged roads, on horseback, and by cart; nor has any accident from spontaneous combustion or otherwise ever been recorded with compounds of nitro-glycerine. I have myself carried both Horsley's blasting-powder and dynamite hundreds of miles through France and other countries with the greatest confidence. Prejudice I know is very strong against us at present on the part of railway and other carriers, but, in the face of facts and recent knowledge, it will, no doubt, soon give way, as many other things of a far more dangerous character are permitted, without much, if any, objection, such as gun-cotton, fulminating mercury, percussion-caps, phosphorus and other matches, naphtha, varnish, &c. Nor are our scientific men ever behind hand in endeavouring to provide for the public safety by their researches on these so-called dangerous substances. The famous chemist (Schrotter), for instance, set the example in regard to phosphorus, which was formerly one of the most spontaneously inflammable substances known. If a piece of it be dissolved in bisulphide of carbon, and a few drops be sprinkled on paper or linen, in a few seconds violent combustion ensues at the ordinary temperature of the air (80° Fahr.); but Schrotter's amorphous, or red phosphorus, with which lucifer matches are now tipped, may be carried about in one's waistcoat pocket with perfect safety, and requires some hundreds of degrees to ignite it. Again, speaking of nitro-glycerine, I have seen Mr. Horsley coolly holding in the fire of a blacksmith's forge a vessel of his protected nitro-glycerine without any explosion taking place; nor did the heaviest blows on an anvil succeed any better. Time was when gas and steam were condemned through fear of danger, yet now by experience, and the light of reason, we look upon them as indispensable benefits. Thanks to science.

June 13. NO SCEPTIC.

CORNISH PUMPING-ENGINES.

SIR,—In the Journal of June 3 you note the duty of the Cornish Engines for April. It would be very desirable that we had the data from which the calculations are made. For example:—The Crenver engine lifted 82·8 millions of foot-pounds of water by the consumption of 1 cwt. of coal. This is about 2·6 lbs. per horse-power per hour. As it would be very desirable if we could procure the data for this engine, perhaps the authority who prepares the "Report" from which you quote would give the particulars and also the probable cost of such an engine.—*June* 12. AN INQUIRER.

NEW STAMPING MACHINERY.

SIR,—Having my attention called to a letter in the Supplement to the Journal of June 3, by a person signing himself "E. C.," on New High-Fall Stamps, and charging me with plagiarism, I hurl back such a charge from whence it came. I have neither seen nor heard anything of what comprises "E. C.'s" so-called invention to the present moment, or whether he proposes to put the bumper, as the Scotchman called it, on the top of the lifter instead of the bottom I know not, but at any rate I have lived too long in a wood to be scared by an owl. I did not know of the charge brought against me until this day, when a friend brought me your valuable Journal containing the same, and I beg to inform "C. E." that during 1861, while I was engaged in erecting the heaviest train of stamping machinery in England, I discovered a method by which a much more effective stamps could be got up, and a saving of about 50 per cent. in the cost of its erection when compared with the old stamps, to do an equal amount of duty, at the same time rendering a much more effective machine. Also during the same year, at the meeting of the Polytechnic Society, at Falmouth, in connection with the meeting of the Miners' Association of Devon and Cornwall, I have been requested by the secretary to supply a paper on stamping machinery, wherein I referred to the invention I had just then made. In 1863 I wrote to a patent office in London to ascertain the cost of a patent for the same; the reply I have now before me.

In 1865 I drew a working plan, and in the early part of 1866 I commenced to make a working model of the same, but being suddenly called upon by Mr. Warington Smyth, chief Mineral Inspector for the Crown, to proceed at once to Linares, in Spain, to erect all the necessary machinery connected with a new 60-in. pumping engine there, at the completion of which I again returned to England, when in the early part of the present year I completed the model above referred to, and find that I can get 60 20-in. blows per head per minute out of the same, every head being so constructed that either one can be put in or taken out without disturbing the rest of the machine, a matter of great importance; and I hesitate not to say that it is one of the best, if not the best, practical machine of its kind ever introduced into this country, every part of the machine being so simple in its construction that it requires nothing but the most ordinary labourer to be placed in charge of it, and completely adapted to all the requirements of tin and gold mining. Again, on March 17 last I brought the subject under the notice of that eminent mine manager, Capt. Josiah Thomas, of Dolcoath, near Camborne, and now beg to say that I am quite prepared to sell the invention to "E. C.," or the highest bidder, whoever he may be, provided he makes me a liberal offer; or I could contract with any mining company, whether at home or abroad, for any quantity of stamping machinery, whether on the new or old plan, that might be required. References to the highest authorities could be given, and working drawings of stamps on the old plan seen, which cannot be equalled in any mine in England up to the present day, a great part of which is a standing disgrace to the British nation, and to the age in which we live. I now beg to take leave of "E. C.," leaving the public to judge who the impostor is, and all anonymous letters appearing upon the subject from this time will be treated with such contempt as they justly deserve.—*Sticker, St. Austell, Cornwall, June* 13. S. SEARLE.

NEW STAMPING MACHINERY.

SIR,—The reason of my not replying to the letter of an anonymous correspondent, "E. C.," in the Supplement to the Journal of June 3 is, that I have had no opportunity of perusing your valuable paper of that date before to-day, neither have I seen the high-fall stamps referred to, or any description of them up to the present time, but the information which I attempted to give was without any prejudice to other inventors. I think, Sir, I shall be able to satisfy the readers of the Journal that the charge of plagiarism belongs to "E. C.," and not to Mr. Searle, as it is quite evident that Mr. Searle had thought of a high-fall stamps long previous to April 22. A letter written by Mr. Searle on stamping machinery was published in the *West Briton* of March 2, where he referred to the stamps in question when he says the stamping machinery of this country is not doing more than half duty, and is a standing disgrace to the British nation. A plan of the same was prepared in the year 1865, the model was begun in 1866, and undoubtedly would have been completed in that year had Mr. Searle not gone to Spain to superintend the erection of machinery there. I have papers before me which will prove that Mr. Searle applied to a patent office in London, with the intention of obtaining letters patent for the same invention, in the year 1863. A paper sent by him was read at one of the Royal Cornwall Polytechnic Society's meetings, in connection with the Miners' Association at Falmouth, in the year 1861, on stamping machinery, when particular reference was given to the same machine. A description of the mechanical details of another's invention does not belong to me to publish, but no doubt "E. C." would be glad to profit by it. As "E. C." is beginning to think the sooner patents are abolished the better, "E. C." must evidently be the copyist, and would undoubtedly have given his real name had his very colourable production been clear of the charge of pseudography. J. MUFFORD.

St. Ewe, June 13.

NEW STAMPING-MACHINERY.

SIR,—I have no doubt your correspondent "R. F.," something like myself, has been accustomed to seeing stamps worked on the old plan, so that without seeing the new one at work it is difficult to understand the difference. Indeed, an old friend twitted me the other day by saying that "after so many years making stamping-machinery you have only now discovered the right way in working them." There is some truth in that, and only shows how much can be done when once out of the old track and into a new one. The first introduction of this plan was to do a great deal of work with small power: in that I have succeeded. Manual power can now be applied successfully, or small steam-engines that can be taken up the mountains where large ones, of course, could not be carried. A small steam-engine of about 2-horse power can work nine stamps by this arrangement, whereas by the old plan it could not work six, and still give a high fall. Saving power and cost of working is the great object of this invention, which anyone connected with mining can see at my works, and judge for themselves. JOHN WALKER.

12, *James-street, City-road, June* 15.

IMPROVED STAMPING MACHINERY.

SIR,—The communication of your Redruth correspondent, "A Civil Engineer," as to the action of stamps, is unquestionably correct as to the difficulty of getting away the crushed stuff quickly enough to prevent the making of too much slimes, but I cannot see at all how his suggestion to increase the grate space considerably could be carried out, because we must have the heads near each other to economise space and power, and we must have the grates as near the head as at present, or the crushed stuff will not splash through. There was one proposition made, I think, by Capt. Wasley, to stamp on an iron bottom with slots, and so to form, as it were, a sieve, but I do not think the invention was ever largely tried, except in lead mining. Perhaps the objection, however, arose from stamping on an iron grating, which was, of course, useless when any part happened to be broken. But the idea seems to me to be good; and if this were the difficulty, I think it could readily be overcome. The bottom should be formed of flat wrought-iron plates (say) ½ inch thick and 6 inches wide, placed side by side, edgewise, and of sufficient length to form the bed. They should be separated by thin strips of wood, and the whole well clamped together. This would, I suppose, form as strong a bed as could be wanted, and one on which scarcely any slimes would be made, and I think very little work would be left for the gratings.

But, after all, it is a little doubtful whether it would not be more economic to abandon the use of stamps altogether, and rely upon stone-breakers and crushers instead. The stone-breaker will bring down the stuff to the eighth of an inch so cheaply that I believe that it could not be surpassed for economy, and crushers would do the rest. The waste of water about Cornish mines is enormous, and I believe that where this is the case there is always considerable waste of mineral, yet Cornishmen have done comparatively little to obviate that waste, and every improvement proposed seems to necessitate the use of even more water. Why have none of the dry stamping apparatus been tried? I saw one a few years since at work in London upon ordinary Cornish ores that worked admirably. The stamps consisted really of a pair of steam-hammers, and as these worked in a closed box the crushed stuff could not escape.

The fine mineral was moved as fast as crushed through a channel communicating with a fan, which passed it on into a suitable chamber. It occurred to me that if there had been a receptacle, of course also closed from the external air, between the stamps and the fan it would have been quite easy to collect the heavier and more valuable portion of the ore in that receptacle, and so diminish the quantity of stuff to be dressed. To do this I think it would be only necessary to regulate the speed of the fan, because the greater the draught the heavier would be the particles that it would carry. If we could separate the ore even roughly by air it would immensely diminish the cost of dressing, for I observed that dry ore was more rapidly moved by air than wet ore travels in water, and that whilst dressing by air can be accelerated by machinery dressing in water cannot be.

Dolgelly, June 12. MINER.

BORING-MACHINES IN METALLIC MINES.

SIR,—I observe a communication in the Supplement to the *Mining Journal* of June 3 on "Mining Progress, and Boring-Machinery," by "Cambrian," wherein he concludes that the introduction of boring-machines into metallic mines is a failure. Admitting that past trials have not been satisfactory, it by no means proves that the introduction of boring-machines into mines cannot be successfully accomplished. I have given this subject much attention, and have come to the conclusion that boring-machines can be successfully introduced into every hole and corner of mines. If I am asked why the engineers who have been working hard at the matter have hitherto failed, or at all events, have only met with partial success? my answer is—They do not seem to understand the whole question with which they have to deal. Much service, however, has been rendered to the subject by the attempts already made, and every encouragement should be given by all interested, to help to promote the boring of holes underground by mechanical instead of manual power.

I do not for a moment intend to infer that there are no difficulties in the way; but I will repeat what I have before stated—"There are no mechanical difficulties connected with the whole subject, which cannot be easily and successfully overcome;" and more than this, it will most certainly be done to the saving of some 40 per cent. of the cost of working some of our mines. Relative to the advantages of using stronger blasting material, there can be no question that "Cambrian" is right, provided such material can be used without an increased jeopardy to health, life, and limb. Unless, however, this can be done, the use of stronger blasting material cannot be justified, for accidents are too frequent from the use of ordinary blasting material as it is. "Cambrian's" principle is sometimes resorted to in respect of gunpowder itself, as the results are far more effective than those of ordinary blasting powder; but for the reasons named it is neither safe nor prudent to use it in blasting under ordinary circumstances; therefore, it is clear the multiplication of blasts is wanted, which cannot be done except by mechanical means, which brings the matter back to the question of boring-machines, and their absolute need, without affecting "Cambrian's" principle, should it succeed.

Wenford, Bodmin, Cornwall, June 13. GEORGE RICKARD.

SCIENCE AND THE EMPIRIC ART INSEPARABLE IN MINING.

SIR,—In the Supplement to the Journal of April 29 a stricture appears on my communication under the above heading, published in the Journal of April 15. My object in that communication was to bear testimony to what I then thought and still think to be true—that no rules of science can ever supersede art, the art of practical observation and the knowledge thereby acquired, in the underground departments of mining.

If I were not the author of the article referred to, but had simply read it as the production of another individual, I think I should have experienced no difficulty in apprehending that the obnoxious paragraph selected by the critic was merely an allusion explanatory—at least so intended—of the antagonism of error at the dawn of truth, and, subsequently, to its progress. Nothing can be more common than the entertainment of distorted or perverted views of truth arising from the indulgence of partial or preconceived notions. If an illustration of this were needed I should be irresistibly impelled towards the letter of "Critic" himself. There is certainly there a case in point—inconsistency, arising from a perverted or partial view of what appears to me as a plain truth. If instead of subjecting the paragragh referred to, from my letter to analysis, dissection, and juglery, he had rendered it thus:—An error to which mankind are very liable when light dawns upon a truth is to begin its elucidation at the wrong end or in the wrong way, sometimes by attempting to separate essential parts of the same thing, and to set in independent motion things which can only obey reciprocating influences, a similar error has been committed by attempting to eliminate harmonious responses by an arbitrary union or unions by force of heterogeneous elements having "no" affinity for each other, instead of rendering it "an" affinity for each other, the sense of the extract would have been materially modified thereby. "Critic", censures me for indulging in what he is pleased to intimate an impropriety of language, and in the same connection confounds that with obscurity of ideas, the possibility of whose existence he admits though shrouded beneath a mass of words, and then in the same breath denies their existence *in toto*, branding the whole concatenation of sentences as unmitigated nonsense. The pervading idea of my mind at the time I penned the paragraph in question was that the universal mind of man in the pursuit of truth was impatient of progress and acquisition, and allowed the prepossessions of too highly estimated success to distort the dawning views of truth and pervert the reason. In other words, the passage in question was intended to refer in a general sense to the tenacity with which error always combats the innovations of truth, and the care necessary to disentangle the one from the other.

When criticism has no better vocation than to descend from its lofty normal pedestal and gratuitously indulge its proclivities in assailing the manner instead of the matter of a non-professional writer, and that writer a practical miner, setting forth his opinions and views as dictated by personal experience, much risk cannot be incurred in assuming the position that its legitimate vocation has ended. It is the province of some men to only distinguish themselves by their attempted demolition of the works of others, in preference to undertaking anything useful on their own account. That the subject upon which my letter descanted is beyond the reach or depth of "Critic" can excite no surprise after the exhibition he has made of his professional, literary, analytical acumen. It is beyond my conception to conjecture even with what an amount of the torturing of language any portion of my communication could be made to sustain an inference that I either ignored the value of science or experience in their relation to mining. Just the opposite was what I intended and did, within what appeared to me judicious limitations.

It is very possible that "Critic" may have been actuated by no more commendable ambition in the preparation of his ill-adjusted critique on my article than to deter all practical men from taking part in the discussion as to what kind of technical knowledge will best subserve the interests of legitimate mining.

Ellsworth, Nye County, Nevada, May 24. ROBERT KNAPP.

ORE DRESSING—No. VIII.

SIR,—The first attempt, I believe, to render jigs self-acting, and thus do away with the great amount of labour required in removing the refuse, as well as the concentrated ores, after each operation, was made as early as 1857, by Mr. Wimmer, of Clausthal. This jig discharged the finished ore through a valve in the centre of the sieve, whilst the lighter and poorer stuff was carried over the partition in front. This machine was found very difficult to depend upon, owing to the centre valve being apt to clog, thereby causing the rich ore to pass over the side of the screen with the tailings. It was not, however, much before 1863 that continuous or self-acting jigs came into general use; in that year they were introduced extensively by Mr. Geyer, of Baden, into his large dressing-floors on the Lahn. From that time till the present continual progress has been made towards perfecting these machines, and the present point attained is as near perfection, with regard to continuity of action and good concentration, as could be desired. It would take up too much space were I to attempt to describe all the different continuous jigs now in use; I shall, therefore, only choose out three, which may be considered as types of the rest.

The accompanying cuts:—Figs. 1, 2, and 3, represent a plan and

Fig. 1.

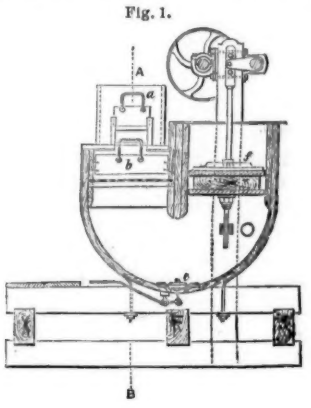


Fig. 2.

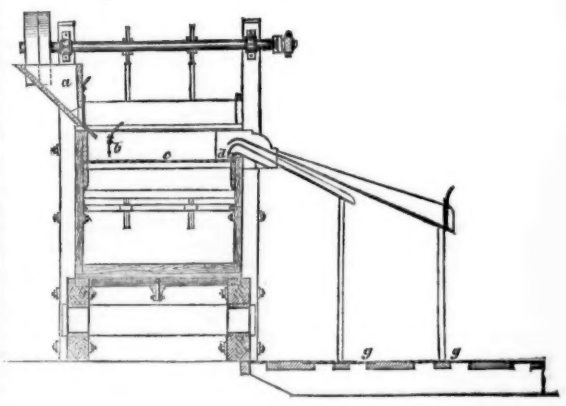
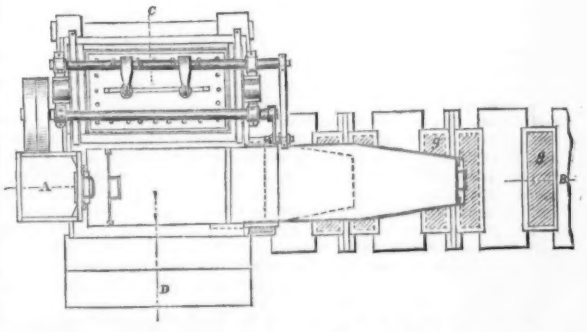


Fig. 3.



sections of one of the most simple forms of Self-Acting Jig, and one which has given me entire satisfaction, in every respect In form it is very similar to the old single jigs, and it can be made of either wood or iron. It is worked by Kley's patent slide gear. The peculiar feature of this jig is the discharge, *d*, which takes place at three

different levels. In order to regulate this discharge from the lowest level, small teeth of wood are placed on the whole breadth of the jig, and at about 1 inch apart. The action is as follows:—The jig being filled with water up to the level of the discharge, the ore is fed in through the hopper, *a*, and forced by the slide, *b*, down on to the screen, *c*. The plunger, *f*, at each stroke forces some of the water out at the discharge, *d*, and forms an intermittent current, which carries the ore towards this point. Of course at each stroke also the ore is lifted, and allowed to settle again according to its specific gravity. When, therefore, it arrives at the point, *d*, it appears in three distinct layers. The bottom layer, which discharges through the bottom opening, is the heaviest and richest ore, the middle layer is composed of ore and gangue mixed, and discharges through the second opening, while the tailings are carried over the top by a small current of water. The perforations of the screen should not be much over two millimetres, so as to prevent as much as possible the loss of the finer grains. The discharge in the above form is the patent of Mr. Hardt, of Cologne. I prefer inserting slide valves, perforated with 1-inch holes, either square or round, at the discharge, *d*, instead of the wooden partitions used by Mr. Hardt. With these slides one may at once without removing the shutes, or disturbing the machine in any way, regulate the outlet of the ore and water. This jig works all ores from ¾ inch to ¼ inch grains with great success, but is best adapted for the larger grains, and certainly does the greatest amount of work of any jig I know. Running at a speed of from 60 to 70 strokes a minute, it will concentrate 12 tons of stuff in a day of eleven hours. The cost of erection is very trifling, I have put them up in Germany at a cost of 25*l.* each. Here in America the cost is about $220, or 44*l.* The amount of water these jigs consume is about 400 litres a day, though the amount varies according to the size of the ore to be treated.

Fig. 4.

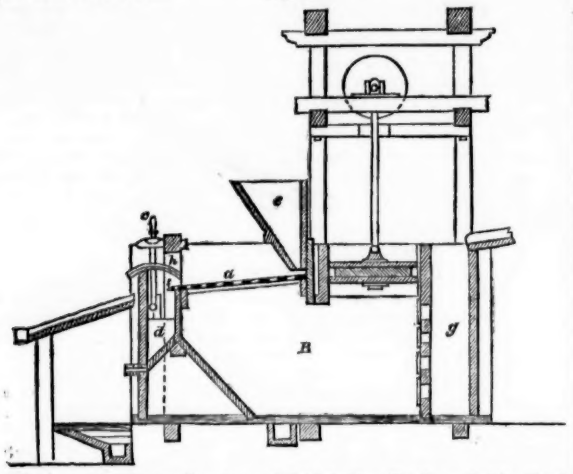


Fig 4 represents another type of Self-Acting Jig, invented by Prof. Rittinger, of Vienna, and exhibited by him in the Paris Exposition of 1867. The chief characteristic of this jig is the inclination of the screen, *a*, towards the front of the box, *B*. The discharge valve, *b*, is formed by a segment of a circle, which is fixed into the lever, *c*, revolving on the fulcrum, *o*, and whereby the opening, *f*, can be increased or diminished in size according to the quality of the stuff to be treated. The ore is fed in through the hopper, *e*, which projects down below the ore bed, and passing over the screen the rich ore escapes through the opening, *f*, into the hutch, *d*, whence it is removed at intervals, while the tailings are discharged over the valve, *b*, and carried away by the stream of water which passes over with them. The inclination of the screen is about 7°. The water is fed in through the tank or reservoir, *g*, which is always kept full. These machines worked at 65 strokes a minute, will put through about eight cubic metres of stuff of (say) ½-inch grains in a day, and requires about 350 litres of water.

E. G. SPILSBURY.

New York, June 1.

ON THE DRESSING OF ORES—No. VIII.

CONTINUOUS STREAM CLASSIFYING APPARATUS.

Fine sand and slime claim the especial attention of the dresser, seeing that the quantity is often very considerable, and in some instances exceeds that of the coarser stuff. The isolation of finely-divided ore from its sterise sand is but seldom accomplished direct, some preparatory treatment being necessary, so as to bring the grains within the scope of particular concentrating apparatus. Connected with the enrichment of fine sand-slime it may be observed—

1.—When light particles are in a state of suspension in water the natural resistance opposed to the freedom of their descent is affected by the slightest movement in the water itself, or by the contact of particles among themselves, either circumstance deranging the direction that each separate grain would take, if it were permitted to obey the simple action imparted to it by its own specific weight, and preventing it from obtaining the position due to it from the mere action of gravity.

2.—The form of the particles may, under certain circumstances, be a cause of derangement, and may acquire an influence all the more important from the minuteness of the grains. As examples, thin scales of sulphide of lead and malachite will sometimes float on the surface of water, in spite of their natural densities.

3.—Particles of sand, so minute as not to settle readily in water, or when settled agglomerating into a tenacious slime, must occasion a loss of orey constituents, as also much labour in the enriching process.

The great waste, cost, and difficulty attending the dressing of fine sand-slime renders it, therefore, of the highest importance to arrange continuous working apparatus, so as to lessen the item of labour, and to pass the stuff from one stage of treatment to another whilst it is freely suspended in water, in order that the grains may be readily separated in the various machines.

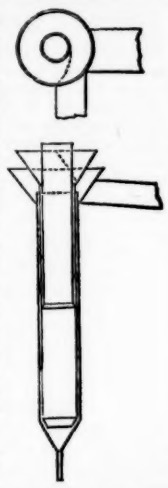
As sizing trommel-sieves for fine slimes are altogether useless, and, as the effects due to specific weights can less readily be taken advantage of with the diminishing size of the particles, it has been found necessary to effect a classification of grains by bringing other principles to the assistance of mere density. Subsequently, in order to effect the concentration of the classified grains, advantage has been taken of the greater or less amount of frictional surface which they offer to a flowing stream on a surface more or less inclined, that surface being, sometimes, material already deposited, as in concave, convex, and hand buddles, or simply one of wood, metal, or canvas.

The difference in the density of particles composing a mixture will also assist in the separating process, for, with regard to two bodies the volume of each of which is equal, but of a different density, the frictional surface, although the same, will in the lighter substance offer less retarding action than the heavier one—the former will, consequently, be carried off, while the latter still continues to offer resistance. In addition, the smaller a grain or particle is, the more important will the surface become in comparison to its specific weight, and the difficulty of separating ore from gangue will also increase in proportion as the grains become finer, since the resistance to movement depending on weight decreases more rapidly than that of the influence exercised by the current on the surface of the particles.

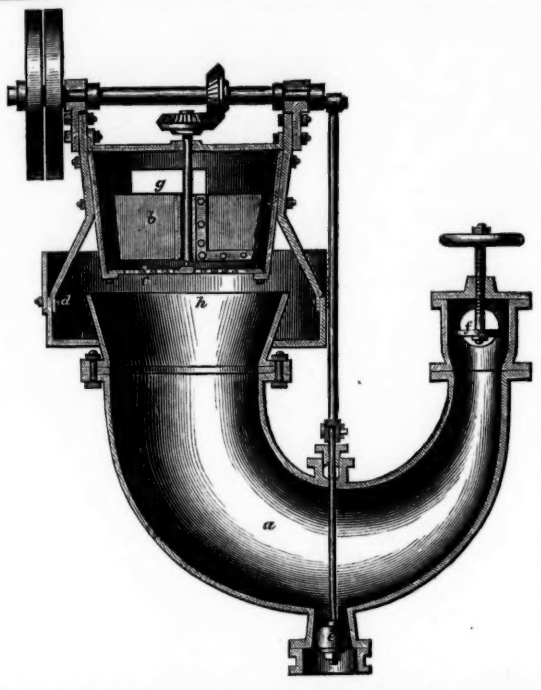
The grains submitted to the action of stream and classifying apparatus may vary in their dimensions from 0 to 1¼ millimetre. In the continuous stream cylinder apparatus only two classes of sand are usually produced, but the classifying trough will afford a separate classification for each of its divisions.

The oldest sizing arrangement is the labrynth or settling-pits. To three kovers, containing nine stampers, four pits were formed, each of which were increased in size from 1, 1¼, 1½, to 1¾ foot square in transverse section, and in length from 15, 21, 24, to 36 ft., with inclinations in the same sequence of ½, ¼, and ¼ in. per foot, the largest being horizontal. Such a system of pits classified the stuff into four portions, different in size of grains, the coarser grains being lodged in the first or narrowest one. This classification was, however, never very perfect, besides which the method entailed expense in clearing the pits and in preparing the products a second time for further treatment. In addition, the loss of fine sand was generally from 10 to 15 per cent. of the initial weight.

GERMAN SLIME PETER.—Fig. 1 shows the form of an apparatus known in Germany as a slime peter. In this apparatus a simple division of the sand is effected by maintaining the influx at a greater height than the efflux of the stream, thereby producing an upward hydrostatic pressure. The sand and water is introduced between the second and central cylinders, clean water is added through the central pipe, and fine sand and water escape through the space between the outer and second cylinders, whilst the heavy grains flow through a pipe ¾ in. in diameter at the bottom. This pipe is provided with a cock, for regulating the proportion of stuff to be discharged both at the top and bottom of the apparatus. The cylinders may be formed of sheet zinc, the short central one (say) 7 in. diameter, the other two respectively 8 and 9 in. in diameter. The length of the outer cylinder may vary from 4½ to 5 feet. The water required for the central pipe is estimated at 50 gallons per minute. At Altglück two slime peters are used in connection with the coarse and fine sand crushing-mills, and one in separating the rough sand from slime before the latter enters into the classifying launder.



VON SPARRIES SLIME PETER.—A sectional elevation of this separator is shown in Fig. 2. It consists of a syphon-shaped pipe, *a*, having a gradual increase of diameter from the clear water entrance to the mouth immediately under the dolly-tub; a dolly, *b*; perforated bottom, *c*; an annular trough, *d*; discharge-valve, *e*; and stop-valve, *f*. Water and slime



enter at *g*, and pass through the perforated bottom into the upward current, when the fine sand and slime flow over the bell-shaped mouth into an annular trough, from which proceeds a waste launder. The grains whose density is superior to the upward force of the current fall to the bottom of the syphon-pipe, and pass through the port-opening, which is alternately opened and closed by the conical valve.

2, *Coleman-street-buildings, London.*

JOHN DARLINGTON.

GOLD MINING IN CALIFORNIA.

POSITION AND PROGRESS OF EAST EUREKA MINE, GRASS VALLEY.

SIR,—In order to more strictly define the location of the above mine, it will be necessary to refer to the celebrated Idaho and the Eureka. This I do for the purpose of showing the dip of the rich rock and large deposits of gold. The Idaho is situated to the east of the Eureka, and it is a well-known fact that all rich rocks and deposits of gold were discovered and are still being found at a much shallower depth than what they were in the Eureka—thus showing that the run of gold is dipping west passing through the Eureka, and losing itself in a fissure of clay in a westerly direction. However, these mines are so rich that they need no comment, and I am proud to say that important and valuable discoveries have recently been made in the eastern part of the Idaho Mine, which so stimulated the committee that they have decided on going further east, and to sink a new and more commodious shaft, they feeling convinced that the rich rock is coming from that direction: shares are selling at $230 per foot, equal to $462,000, for the mine, paying $5 per foot monthly dividends.

Adjoining the eastern boundary of the Idaho commences the lines of the East Eureka, running east 3000 ft., on precisely the same lode. This property has been extensively prospected, with good results. The rock is of the same character as that found in the croppings of the Idaho and the Eureka, and, like those mines, the deeper we get the more encouraging are our prospects. In January last this mine changed hands, and also the name, being formerly known as the Grass Valley Consolidated, of which from time to time many of my reports appeared in the Journal, and I can truly say that I am very much pleased to see by the developments making that the verification of the said reports is near at hand, and soon the grand mystery will be solved. On April 21 we had the mine drained, and commenced to drive our bottom level west at a depth of 200 feet. At a distance of about 12 ft. a stringer from the south formed a junction with the lode, and made a great change. The lode previous to this was not unkindly, but barren; it is now from 15 in. to 20 in. wide, and occassionally showing free gold, and looks as if it would yield $20 per ton. In the winze sinking under the 100 ft. level the lode is from 3 to 4 ft. wide, producing gold-bearing rock, but not rich. In the stopes in the back of the said level the lode is 1 ft. wide, producing splendid rock. We have selected some that will pay over $100 per ton. These are all the points we have in operation at present, but enough has been seen to fully corroborate every iota of my former reports respecting this valuable property, and I do not hesitate in saying that the company is in possession of a mine not to be eclipsed even by the Eureka or the Idaho.

I cannot close this communication without giving some particulars of our mill and appurtenances. The building for its reception is 44 ft. by 120 ft., with 24 feet posts; boiler and engine-room, 23 ft. by 40 ft.; 14 in. cylinder engine, 30 in. stroke; boiler, 16 ft. long, 54 in. diameter. The battery consists of 20 stamps, each weighing 860 lbs., which drop 80 times a minute, and are capable of crushing 50 tons in 24 hours. The mortars (the heaviest ever cast in San Francisco) weigh 5300 lbs., each resting on timbers set on end, 14 ft. long, and 30 in. square, and are the largest size ever made for such a purpose—all perfectly secure, being joined with bolts in such a manner as to prevent any jarring from the concussion of stamps and cam-shaft. The foundation which supports this ponderous weight is made with a thick floor of concrete being laid on the bed-rock, and well-tamped with hot irons—thus forming a conglomerate which is harder than the rock beneath. Our process for saving gold consists of blankets, copper-plates and four amalgamators, two Eureka rubbers, one improved grinding-pan, and settler. The quartz will be dumped from a tramway leading from the shaft, 16 ft. above the platform, passing through a powerful rock-breaker down to the feed-floor, 12 ft. below. This mill, which is considered by competent persons to be the finest in the State, will be completed and ready to start in about six weeks from this date, and the very first tap it gives the mine will begin to pay, and before we attain the depth of its sister mines all my predictions will be realised.

THOMAS FAULL.

Grass Valley, May 22.

THE GOLD MINES OF URUGUAY.

SIR,—I have just seen a letter, signed "F. R. G. S.," in the Journal of May 6, asking what has become of the company formed to work the gold mines of Uruguay? The company was duly formed, and the very best machinery that could be built, together with the houses and 38 men, were taken out by me to Monte Video, and thence to Salto, and after unloading the machinery there I was about to take it to the mines, when the Monte Video board of directors appointed a "Native Tax Collector" to hold supreme direction of affairs over myself and men, contrary to the agreements entered into between us, and completely neutralising the contracts I had entered into with the men in England, and countersigned by the board of directors there. Both the men and myself refused to sanction the alteration, and the men returned to Monte Video, leaving everything at Salto. The company then declared they would not adhere to the contracts they had signed, or pay the men's passage back, and it was only through the medium of the British Ambassador that they were driven to sending all hands home again. As to myself, they refused to carry out the contract they had made with me or pay me, and until they do I hold all the plans, &c. Immediately after my departure from Monte Video the revolution broke out between the Colorados and Blancos, and appears not to have ended yet, utterly preventing any work being done on the ground, even had the parties then in office been inclined to proceed. My last advices state that everything is as I left it. That there is plenty of gold there if properly worked there is no question whatever.

HUBERT BANKART.

Salt Lake City, Utah, May 29.

P.S.—A notice was issued by the Board of Emigration Officers in London after I left Uruguay, in March, 1870, warning British subjects from going out there, on account of the impossibility of the British Government to protect their lives or property.

AMERICAN MINING, AND BRITISH CAPITAL.

The following letter has been addressed to the *Times*:—

SIR,—As a citizen of the Pacific coast, I have read with interest your remarks on some mining enterprises recently presented to the British public. That you regard them with disfavour is quite manifest. I cannot believe, however, that you intend to discourage any legitimate branch of industry. Touching the merits of the schemes which have elicited your disapproval I have nothing to say; but as inferences prejudicial to American mining interests generally have been drawn from your remarks, I venture to ask the privilege of stating why the owners of valuable mining properties may reasonably seek the aid of capital in this country. Legitimate enterprises likely to result in an increased production of the precious metals should, I think, meet with special favour from British capitalists.

Since 1848 the mines of the Pacific States and Territories have yielded about $1,400,000,000, of which Great Britain has received not less than $900,000,000. The average shipments during the past ten years have been about $50,000,000 a year. In 1848, according to bank returns and estimates, the amount of gold and silver in the United States was $112,000,000. The amount estimated at present to be in the Treasury and banks is about $200,000,000. Very little is in circulation, and the whole amount of treasure in the country, including bullion, would not probably exceed $300,000,000. Nearly all that has been produced has been exported, and London, as the commercial centre of the world, has received nine-tenths of it. This accession of wealth has stimulated the productive industry of your country, promoted the interests of commerce, and contributed materially to your national prosperity. In the language of Sir Archibald Alison:—"That which for 25 years had been wanting—a currency commensurate to the increased numbers and transactions of the civilised world—was now supplied by the beneficent hand of nature. The era of a contracted currency, and consequent low prices and general misery, interrupted by passing gleams of prosperity, was at an end. Prices rapidly rose, wages advanced in a similar proportion, exports and imports enormously increased, while crime and misery as rapidly diminished."

The treasures of Australia lent their aid to this beneficent work; but surely England has no cause to be dissatisfied with the contributions made to her wealth from the Pacific coast, or to discourage a pursuit by which she has become enriched. If mining in the United States has proved a hazardous business, permit me to ask who has taken the risks and who has suffered the losses? Certainly not our English friends; for the whole amount of British capital invested in American gold and silver mines, during the past 20 years, does not, I am sure, reach 1 per cent. of the product. In fact, we have had very little aid from foreign capital. What has been achieved has been the result of our own labour and energy. I have heard much about frauds and losses since my arrival in London; but so far as investments in American gold and silver mines are concerned, I think the charges are very loosely made, and are for the most part imaginary. Undoubtedly, wherever money is to be obtained rapidly a premium is offered for dishonesty; but is it not rather illogical to assume that because dishonest people engage in a business, therefore honest people should keep out of it? I fear but little progress would be made in railways, telegraphs, or other improvements, or even in religion, if this doctrine were to prevail universally. In 20 years' experience of our mines west of the Rocky Mountains I am not acquainted with half-a-dozen instances in which British capital has been sacrificed by fraud or by lack of value in the mines, and in those cases which have occurred I venture to assert that the guilty parties do not all reside on the Pacific coast.

Why do we come here for capital? is a very common question. If our mines are so productive, why not enjoy the profits of them ourselves? Let me answer these questions Yankee fashion. If you can get 4 per cent. a-year at home for your money, why invest it in foreign securities? If your domestic investments are so much safer, why not enjoy them? Because you do not get enough at home for your money; and we come here, because we have to pay too much at home for our money. The last number of the *San Francisco Mining Press* says:—"On this coast a mine is not considered a success unless it returns the enormous dividend of 5 per cent. a month—at least, our capitalists are unwilling to invest at lower rates." The truth is, they have not the capital to invest; the demands for capital to open up good mining properties are far greater than the supply. As long as the superficial deposits lasted, expensive machinery and skilled labour were not required; but quartz mining requires both, and we are compelled to seek for capital to secure them where it is most abundant. Many excellent mines, capable of producing 2 or 3 per cent. a month upon a given capital, remain idle because the owners have gone as far in opening them as their means will permit, and cannot borrow money, even at 5 per cent. a month, to erect the machinery necessary to work them with profit. It is a great mistake to suppose that because an enterprise is promising or a property valuable there can be no good reason for disposing of it. Such logic would put an end to all exchange of commodities, all traffic between individuals, all intercourse between nations. I contend that no business, judiciously conducted, is more profitable than mining.

With all the gambling in stocks, and the disasters resulting from reckless speculations, there never was so much confidence in the value and permanency of our mines as there is at this time. Nor is this feeling without foundation. The Comstock lode, Nevada, has produced in 10 years $120,000,000; it has paid $30,000,000 in dividends, built up a city, and improved the country. Grass Valley, California, has yielded $30,000,000, of which $15,000,000 may be placed to account of profit. Gold Hill alone produced $7,000,000—two-thirds of it profit; the Eureka Mine has netted $1,500,000; the Allison Ranche, $1,000,000; Haynant's Mine, in Amador, $6,000,000 gross—probably

$4,000,000 net; the Sierra Buttes has paid in dividends over $1,200,000; and various other mines in California and Nevada are producing dividends of 30 to 40 per cent. a-year upon the capital invested. I have just completed an extended tour through the most prominent districts, and never saw the mines looking better or paying better. With a few millions sterling judiciously invested in smelting works and the development of properties of demonstrated value, the product of our mineral regions might be doubled within a few years, and I know of no investment likely to pay better, and no country that would profit more directly by the increase than Great Britain.

J. ROSS BROWNE,
Formerly United States Commissioner of Mining Statistics.

OUR COMMERCIAL WEALTH—THE BANKING INTERESTS—No. III.

SIR,—We are probably considerably under the mark when we state that 17,000,000*l.* sterling will be distributed next month in the shape of dividends on securities dealt in on the London Stock Exchange. Upwards of 6,000,000*l.* is payable at the Bank of England on English and Indian Government stocks; 750,000*l.* is a moderate estimate for the dividends on Colonial Government bonds, and those on Foreign Government loans may fairly be put at 9,000,000*l.*, making 15,750,000*l.* on these three classes of investments. In addition to these the dividends are payable next month on English railway debenture stocks, Indian railway stocks, and on numerous miscellaneous securities, and which together must amount to considerably more than 1,250,000*l.* This large sum must tend greatly to augment the stock of capital at present unemployed. The value of money is simply 2 per cent. on Government and approved securities? the latter must be of first water, and equal to bank bills in quality and character, otherwise they are rejected. Merchants' acceptances are only discounted in the money market when their creation can be recognised and their consistency traced—*i.e.*, founded on legitimate trading and commerce, and free from the taint of speculative dealings. Bills of a second and third rate standing can only be *sold*, the money market reject them; hence the difficulty in promoting enterprise and fostering the speculative spirit of the age. The fact is that previous to the panic of 1866 "borrowers" of money contrived to beat the "lenders," and the latter became swallowed up and the former ruined in having to meet their engagements in "full" and at "once," whilst their resources too early became exhausted through realising at sadly reduced prices. These two classes of the commercial hemisphere are defunct so far as the resuscitation and progress of speculative enterprise are concerned. The borrower has lost "credit," whilst the lender accepts only *bona fide*—developed instead of prospective securities.

On Thursday, June 8, the Bank of England had only dealings with the public in "other than Government securities" to the extent of 16,684,209*l.*, and against this description of business their "customers" had deposited the sum of 17,890,496*l.* The Bank, however, had the small commitments of 497,602*l.* in seven day and other bills; this sum, added to the 16,684,209*l.*, shows that the ordinary banking business possessed at that date a surplus of 708,685*l.* cash in hand. The notes in active circulation amounted to 24,145,370*l.*, to which 497,602*l.* seven day and other bills must be added—say, 24,642,972*l.*; to meet this sum the Bank held in its coffers 25,219,227*l.* in gold, coin, and bullion, showing a surplus in hand of 576,255*l.*

The true position of the Bank of England appears to be as follows:—Notes issued, less Government debt, and other securities, 24,558,805*l.*, as its charter or agreement with Government allows a circulation of 15,000,000*l.* without depositing gold and bullion in the issue department. We, therefore, commence the subjoined table, first debiting the Bank with 24,558,805*l.* notes, and crediting it with 15,413,435*l.* notes in hand—that is, in its tills and safes, consequently unissued to the public—hence on balance the Bank is liable to redeem only the sum of 9,145,370*l.* of the 24,558,805*l.* active circulation:—

TABLE No. I.

By proprietors' capital	£14,553,000	0	0	
By rest on guarantee fund	3,098,179	0	0	
By coin and bullion	25,219,227	0	0	
By public securities, Government	12,971,405	0	0	
By customers' securities	16,684,209	0	0 =	£72,526,020 0 0
To notes issued to the bank	£39,558,805	0	0	
By Government debts and securities	15,000,000	0	0	
To notes issued to bank liable to redeem	£24,558,805	0	0	
By notes in tills and safes	15,413,435	0	0	
To notes issued by the bank, and for which it is liable	£ 9,145,370	0	0	
To public deposits, Government	9,690,194	0	0	
To customers' deposits	17,890,496	0	0	
To seven days and other bills	497,602	0	0 =	37,223,662 0 0
Total balance				£35,302,358 0 0

TABLE No. II.

The surplus balance at the disposal of the Bank directors amount to the sum of 35,302,358*l.*—namely,

Proprietors' capital	£14,553,000	0	0	
Notes issued under its Charter, and arrangement with Government	15,000,000	0	0	
Rest and surplus in hand	5,749,353	0	0 =	£35,302,358 0 0

In the face of July dividends, and the already glut of money, it is a problem worth solution, and to ascertain, if possible, in what direction investments will become directed. At present mining in California is alone prominent. Yet, large as the capitals are for the several companies, it is satisfactory to reflect that the greater amount will be retained in England. The working portions are comparatively small, and the successful "issue" of shares will act chiefly as a vehicle of transferring money from one party to another. As an instance, we select the following:—

The Colorado United Gold and Silver Mining Company is now before the public, with a capital of 120,000*l.*, of which 20,000*l.* is set apart for working: 52,800 tons of ore are said to be in sight, worth 6*l.* per ton, according to the report of Mr. George Teal. The question arises in our mind as to whether ores worth 6*l.* per ton are worth working by English companies in California. Mr. Teal estimates that one-half will prove profits, and the prospectus is full of promise. We do not desire to detract from the merits of this concern, yet still we may fairly ask our readers what amount of gains can they expect to reap, when they pay 5*l.* premium for every 1*l.* of working capital?

At the same time allow us to state that 120,000*l.* laid out in legitimate mining in the "East Cornwall district" could not otherwise than lead to most brilliant and satisfactory results. We should at the same time have the mines in the Mother Country, and reap the benefit of the expenditure of the costs of working, materials, machinery, and labour at home, instead of abroad. The outlay of 120,000*l.* in Cornish mining would infuse energy and enterprise amongst a wide circle of speculative capitalists, whilst we should secure all the advantages to ourselves.

The East Cornwall district, stretching from the Tamar to the Caradons, a distance of rather more than ten miles, contains many valuable unwrought properties, although they exhibit every indication of mineral wealth, if only capital could be obtained to develope them.

The *East Caradon* at one time sold at 300,000*l.*, *West Caradon* at 100,000*l.*, and *South Caradon* at or over 200,000*l.*, and the gains have been large from each, yet more especially the latter, which reach to the enormous sum of 340,000*l.* upon 640*l.* subscription.

The *Phœnix* is now one of the richest tin mines we possess, and for many years it was one of our best copper-yielding properties.

Holmbush and *Kelly Bray* have given large quantities of copper, as also the *Hingston Down Consols* and *Gunnislake* (Clitters), with other mines. As regards tin, *New Great Consols* is now yielding 17 to 20 tons monthly, and stands to the north of *East Kit Hill* and *New Hingston*, these three mines being traversed by the same north and south or magnetic cross-course. The two latter are at the slope and base of *Kit Hill*, long celebrated as the centre of rich-producing minerals.

Mr. Vosper, associated with eminent local capitalists and engineers, has opened an office in London to attract notice to the East Cornwall district, and at present invites attention to *East Kit Hill*, divided into 12,800 shares, of 1*l.* each, to be issued in 64ths of 200 shares, each; 5*s.* per share is to be paid down, leaving 15*s.* uncalled for working. The first instalment, after paying for the mine, leaves 960*l.* in hand. The reports are highly encouraging, and the promoters are gentlemen of local influence.

New Hingston consists of the same number of shares, but 10*s.* is called up, which after paying the vendors leaves 4400*l.* to work the mine; this sum is deemed ample to develope the property, yet to provide for contingencies a further capital of 10*s.* per share is subscribed for, which provides an additional sum of 6400*l.* if necessary. The same remarks apply to this undertaking as to the East Kit Hill. The promoters are practical and the reports good.

Mr. Vosper and his friends have commenced in a good district, and possess favourable analogy of surrounding mines. The *Devon Great Consols*, *Bedford United*, *Hingston Down*, and *Drake Walls* are all within a circle of one to two and a half miles. There can be no doubt entertained that the East Cornwall district is rich in mineral wealth, not only as regards tin, but likewise copper and lead.

R. TREDINNICK,
3, *Crown-court, Threadneedle-street*, Consulting Mining Engineer.
London, June 14.

THE TONTINE SYSTEM APPLIED TO THE PURCHASE OF RAILWAY SHARES OR STOCK.

SIR,—I am desirous of submitting through your columns an idea I have long nourished, but was timid to give out—a plan for holding Railway Stock or Shares by Tontine Associations. Permit me briefly to explain:—

1.—I take a really good railway scheme, part made, but which collapsed on the "Black Friday." About half its capital is expended in the purchase of land, &c.; there remains to be expended about 100,000*l.* of its capital; its borrowing or debenture powers have not been enforced, and are, I believe, some 50,000*l.*, or thereabouts. I propose to deal with its unissued share capital—this 100,000*l.*—by means of a limited liability company on the tontine principle. I propose to have an issue of 1000 certificates, representing each ten 10*l.* shares of the company, and I propose to issue the certificates at 90*l.*, or 10 per cent. discount. I propose that each certificate should represent a life of either the tontineer or his nominee. I propose the tontine shall last ten years, and that the survivors at the expiration of that period, or their representatives, shall become the actual owners of this 100,000*l.* stock or share capital fully paid up.

Assuming such an association formed and capital paid up, I propose to give it the option of taking, when issuable, the debenture capital on the same principle. It will be obvious that the tontineer can in each case if he likes cover his risk by means of life assurance, and—

First Example.—Take, for example, the case of a single life, representing a certificate of 100*l.* The person can issue his life 100*l.*, age (say) 25 years, annual premium 2*l.*, or a total of 20*l.* for the ten years period if he survives to its termination. If the life drops within that period his representatives get back 90*l.* paid for the shares, having, no doubt, the benefit of the dividends earned sufficient to return him a good interest for his investment, and also keeping up his policy. And should he survive the ten years he becomes a part owner of the whole property without further liability.

Second Example.—Take the case of a family holding each a share—

Husband, aged 40, £100 insured, annual premium					£3	0 0
Wife	38,	"	"	"	2	17 6
1st child	20,	"	"	"	1	16 0
2nd ditto	18,	"	"	"	1	14 0
3rd ditto	16,	"	"	"	1	12 0
Total annual premium					£19	19 0

In this case the benefits from the tontine system are still more striking. Assuming the whole family to survive the whole period of ten years, the maintenance of the five policies would amount to 109*l.* 10*s.*, or little more than 2 per cent., which would, with a fair interest for the investment, be provided out of the accruing dividends.—*London, June* 14. NEMO.

PARYS MOUNTAIN MINE.

SIR,—Having recently visited this celebrated mine, some little account of its present position and prospects might not, I have thought, prove uninteresting to some of your readers. From the enormous amount of profits already yielded by this mine—upwards of six millions sterling—it might be considered by some, giving but passing thought to the subject, that the riches of Parys had been worked out. Such an idea, however, could scarcely be entertained by other than those unacquainted with the great extent of the sett, and with the character of its present productive lodes. The property is one and a half mile from east to west, and three-fourths of a mile in width, and but a small portion of the ground has yet been explored.

Not any of the lodes have been fully used up yet, nor followed to their length, although operations on many points are suspended, and immense reserves of copper ore retained in hand, in the hope of an advance in the standard. Nearly the whole of the large space between the Carreg-y-doll lode and the "open cast" remains as yet unwrought, although it is known to contain at least three lodes. The cross-cut from the North Discovery lode at the 90, the principal feature of recent interest, has cut both the south branch course and the Carreg-y doll. If it were continued south it would prove all this great extent of ground. The cross-cut might even be continued under the open cast, and to the southern boundary, the lodes that it would pass through there being more likely to be cut productive than at a higher level. It is to be noted that the original proprietors of the mine, apparently contented with the emptying of the great cornucopia, or afterwards attracted by the riches of the two great lodes far to the north, took no steps to seek for copper in the open cast lower than 55 fms. from the datum line, or surface. One exception is, however, to be made to this general statement—that Colonel's shaft was sunk to the 75, a cross-cut was driven for a short distance, and ore was met with.

Cross-cuts are now being pushed on as fast as possible towards the Carreg-y-doll at the 80 and at the 100. In reference to the latter the distance will not be considerable, and as the dip of this lode to the north exceeds by 25 per cent. that of the south branch vein, there may probably, at a not much greater depth, be a junction of the two with favourable effect.

At the western shaft copper ore was found right up to the surface, but becoming after 14 fms. hard and poor the working was abandoned. From the well-known fact of the changeableness of the Parys lodes, occasionally becoming poor and narrow, and then enlarging into rich pockets, or "bellies," it may be well worth to search further at this point. Good ore was obtained from a quarry on the company's land, excavated for stone; and to the west of this, at the 45 from the North Discovery lode, there is a cross-cut, which intersected a lode more to the north than either of the others that had been worked. After the ore had been taken out for a few fathoms east and west it became necessary to discontinue, from the difficulty of ventilation and of removing the ore, it being at a distance of 200 fathoms from Gwen's shaft. It may be a question whether it would be best to sink a new shaft on the lode, or to open from the western shaft, or whether it would be more economical, in view of the excavation already effected, to communicate by a diagonal cut from the quarry. This lode has been intersected by the cross-cut from the 30 towards the east boundary. The driving north from the 90, near Gwen's, may also in 10 or 15 fms. more cut this same copper-bearing lode at that depth, its underlie being 3 ft. in 1 fm. The 30 east, on the North Discovery vein, had not been prosecuted, but is now being driven upon. If found successful at this level it will in all probability, as it has done in the west, continue rich down to the 112, and there would be 160 yards in length before reaching the Mona Mine.

I have not yet even touched upon the special features of interest in this remarkable mine, but will, with your permission, reserve the conclusion of these remarks for next week's Journal.

PATIENTIA.

MINING IN CARDIGANSHIRE.

SIR,—Since the report which appeared in the Supplement to the Journal of June 4 several improvements have taken place—as in the Glan Castel and the Nant-y-Moch Mines. The stuff broken from the former is as good as can be found in a day's march—really splendid specimens; and in the latter the lode is improving in the shaft, and all that is required in either of these young mines is depth. Having left off last week with the Llywernog Mine, I would now again introduce to your readers the celebrated POWELL UNITED. I can only, as others before me have done, speak well of it, as it deserves. The deepest part of the mine is the 72 fm. level west, in which the lode is at o it 4 ft. wide, with a beautiful leader of lead ore and spar of the most magnificent form, as can be found only in vughy ground—and here they have them in all their splendour and beauty. I should think the end at present worth from 2 to 3 tons of silver-lead ore to the fathom, and certainly daily improving. A winze is being sunk from the bottom of the 62, coming down to the 72, a good many fathoms west of the present end, in a lode worth 4 tons to the fathom. We may, therefore, easily calculate upon the lode still improving until it shall equal or even surpass the beauty of the winze, as level after level has done from the beginning of the mine. Other bargains are doing very well; but at the present moment it is, like all its neighbours, short of water—plainly showing the agents the benefit a leat from the Rheidol river would be. This I hope will be done before another dry season, as it is now in contemplation. Lodes from Llywernog Mine, Clara, Ponterwyd, and Cefn Cwm Brwyno are all running into the Powell sett, so that many thousand tons of lead lie buried there, only requiring the miners digging after it.

BWADRAIN comes next in rotation, to the south-west of Powell United, and south of the Cwm Brwyno. This mine is now down 55 fms. from surface. In the 30 they had a very nice bunch of lead, but have gone through it, doubtless searching for another. In the 41, and in almost entire new ground to surface, they have got into a lode worth fully 1¼ ton of lead to the fathom, the same as in the level above, but further, showing the bunch to be spreading in depth, and now the 55 is being carried on with all speed, so as to come into this beautiful shoot of ore. I can fancy the agent's almost sleepless nights, anxiously longing for the dawn to reveal to the light of day that good and precious metal as yet never seen in the 55. I hope it may continue for many levels yet. The machinery in general is good. There is a water-wheel down by the river Rheidol, working two lines of rods, half a-mile long, up the hill, 600 ft. high, 33°. By this a plunger is worked, which throws back the water which has passed over the other water-wheels which drives the drawing-machine, and by this process all the water is saved—or, in fact, is continually going again and again over the same wheels. Neighbours may complain at this very dry season, but Bwadrain may rejoice. I saw some very nice stuff on the floors then being brought up from underground. They are selling 30 tons monthly. I should mention that the water which is lifted by the plunger runs over 30-ft. and 22-ft. wheels, being worked by the wheel in the valley—the engine-wheel. A winze sinking under the 45 to the 55 is now down 3 fms. for air, and 8 fms. for cutting out stopes.

I would again thank the agents of all the mines I have so far reported on for the great kindness at all times shown to me, and, no doubt, to everybody else; and I would also give a word of advice to London shareholders, who are very ready to send mining agents from Cornwall and Devonshire into this county to inspect mines before they, perhaps, like to venture becoming shareholders in this or that particular mine. I would tell them that the man who comes here from another county would be as ignorant of the lodes, strata, &c., as a poor Welshwoman would be in Cornwall making pasties. If Cornish, or Devonshire, or Welsh men of years standing cannot satisfy the would-be shareholder, he can never be rightly justified with the report of the stranger. I have this for a fact from agents who have seen the country once, and but from their seeing mineral of great quantity could hardly tell the lode from the country.

Penllwyn, Aberystwith, June 12. SAMPSON TREVETHAN, M.C.E.

[For remainder of Original Correspondence see to-day's Journal.]

Meetings of Mining Companies.

GREAT WHEAL VOR UNITED MINING COMPANY.

The quarterly general meeting will be held on Wednesday.

The profit and loss account for the three months ending May shows:—

Mine cost (Jan., Feb., and March)	£3197	19	8	
Merchants' bills (Jan., Feb., and March), less discount	1950	9	3	
Dues	155	16	0	
Sundry payments	181	18	4 = £5785	3 3
Black tin sold, February	£1626	15	5	
ditto March	1222	0	9	
ditto April	2005	5	2	
Tribute and royalty on tin sold from Roseladon, &c.	74	6	0	
One year's rent of Poldown tenement to Lady-day, 1871—May 26	4	0	0	
Half-year's rent of Trew tenement to Lady-day, 1871	5	16	0	
Cash balances	7	8	5	
Balance (loss)	840	11	0 = £5786	3 0

The audited cash account, made up to April 30, shows a balance of 357*l.* 4*s.* 10*d.* (cash at bankers and petty cash).

The ground sunk and driven during the three months was 33 fathoms 2 feet.

WEST WHEAL KITTY MINING COMPANY.

A general meeting of shareholders was held on the mine on June 7, Mr. J. B. REYNOLDS in the chair.

The notice convening the meeting and the minutes of the previous one having been read, the balance-sheet, showing a balance due to the bankers of 364*l.* 4*s.* 5*d.*, and a total balance of liabilities over assets of 428*l.* 14*s.* 5*d.*, was presented, and the subjoined report of Capts. Joseph and William Vivian was submitted:—

June 7.—Since the meeting on Dec. 22 we have driven the deep adit west 3 fms., and have intersected and cut through the eastern cross-course, and have met with the lode on the western side of it, which is 5 feet wide, very kindly in appearance, and producing saving work for the stamps; and it should be borne in mind that this level is 18 fms. below any workings to the west of it, and from which workings larger quantities of tin have been extracted, and there are several good shoots of tin now standing in the bottom before us; therefore we are of opinion that this level should be pushed on with a full complement of men, where we think profitable tin ground will be laid open for stoping. The middle adit has been driven 7 fms. west on the south side of the north part of the lode, since which it has been driven 9 fms. south, the last 3 fms. of which have passed through several small branches containing tin, but not in sufficient quantity to pay for stoping. We are at present driving north, in order to cut through the north part of the lode. The stopes in the back of the middle adit are a little improved. The water in the old mine is 10 fms. below the deep adit, and most probably will sink further as the season advances.

It was resolved,—"That the action taken by the secretary with regard to the sale of 1185 forfeited shares, in one lot, and without any reserved price, be approved; and that after the sale a special meeting of shareholders should be convened in London, to confirm such sale, together with the minutes of this meeting, and to transact such other business as may be necessary, as well as to make such a call as may be needful to carry on the works."

TREVARRACK MINING COMPANY.

A general meeting of shareholders was held on the mine on June 6, Dr. J. COLLIS BROWNE in the chair.

The usual preliminaries having been disposed of, the balance-sheet, showing a balance of liabilities over assets of 603*l.* 12*s.*, was read, and the subjoined reports of the committee and of the manager were submitted:—

June 6.—Your committee have much pleasure in meeting you at another ordinary general meeting on the mine, and they trust that everything which has come under your notice to-day may meet with your approval. They remark that the amount of work done has been considerable, and of great importance. As you will gather from the manager's report, levels are being extended, from which good results may be expected. The shaft will be sunk to the junction with all possible dispatch, and it is proposed to lay open other lodes, which are understood to pass through the company's right, with a view to further, and it is hoped, profitable operations. Your committee venture to express a hope that the proprietors here to-day, as well as those who are represented by proxy, will share in the opinion that the company is greatly indebted to Capt. Pope for the efficient manner in which he has conducted the management of the operations. After mature consideration, the committee recommend a call of 7*s.* 6*d.* per share, which will place the company in a good financial position, and no time will be lost either by the agents or the committee to push on operations with a view to profitable results.

Capt. James Pope reported as follows:—

June 6.—Browne's engine-shaft is about 4 fms. below the 30; lode at present disordered by a horse of granite, but this, I think, is only temporary, and is far from being an unfavourable feature; but in a few feet more sinking, from its appearance, the horse will disappear, and the lode improve. The 30 is driven west about 2 fms.; lode 3 ft. wide, with a prian course on the north side about 1 ft. wide, producing low-quality tinstone. The 30 is driven east about 6 ft.; lode 3 ft. wide, with a prian course on the north part 9 in. wide, good work for tin. Since the engine commenced working we have sunk the engine-shaft nearly 20 fathoms, through a lode varying in size from 3 to 4 ft. wide, producing tinstone nearly the whole distance. In sinking the shaft about 10 fms. deeper we expect the north lode will be intersected, and I have every reason to expect a great change in the lode for the better about this intersection, as about these junctions generally an improvement takes place. I never thought so highly of the property as I do now.—JAMES POPE.

The CHAIRMAN, in moving the adoption of the balance-sheet and reports, said:—I have been always gratified whenever I have visited this property, but I do not recollect ever being so well satisfied as I am on the present occasion. I feel it, as your Chairman, a duty incumbent upon me to see that everything is being carried out in a straightforward and business-like manner, not because I have the slightest doubt of the ability or integrity of the local authorities, but because I know those whom I represent have a right to expect me, as the Chairman, to see for myself, from time to time, that all are doing their duty. It is well known that all our meetings have been most harmonious, and I account for the fact in this way—that no one is able to find any fault with the management, or with the mine. I hold a large interest in the company, and I feel perfectly satisfied with the investment, believing, as I do, that it will turn out remarkably well for all concerned; and when I recollect what benefits result from an extensive and profitable mine, in a neighbourhood like this more especially, I feel assured that the efforts of all those who energetically prosecute mining undertakings in this county deserve and will receive the thanks of an intelligent community.

The reports and accounts were then unanimously adopted; the balance of 6 7*l.* 17*s.* 3*d.* due to the bankers acknowledged, and a call of 7*s.* 6*d.* per share was made.

Mr. JOHN B. REYNOLDS called upon Capt. Pope for some particulars in addition to those contained in the report.

Capt. Pope stated that notwithstanding his very long experience he had never met with a more promising undertaking. Of course a mine was not developed

in a month; the shaft must be sunk and the levels extended; but he had no reason to doubt but that the shareholders would be amply rewarded for their outlay.

Mr. STEPHENS had every reason to be pleased with the prospects, and felt confident of success. After some further remarks the meeting terminated, with a vote of thanks to the Chairman.

THE QUEEN MINE—ENCOURAGING PROSPECTS.

So much doubt has for some time past been thrown upon the discoveries of silver said to have been made upon the Queen Mine, near Albaston, and the absolute disbelief in it has been so great that, for the sake of the shareholders and other interested in the concern it became a matter of importance that the truth should be ascertained and placed before the public. All the letters and all the arguments which have been written and adduced from time to time by Mr. T. J. Barnard and Mr. W. H. B. Kempe, both of whom have a very large stake in the concern, have failed to convince persons at a distance of the value of the discoveries of silver which have been made, and the *Mining Journal* and other London papers have warmly discussed the subject. A meeting of the shareholders, held at the mine yesterday afternoon, afforded our reporter an opportunity of going over the mine, and at the same time of witnessing the interesting process by which the silver is produced from the ore after it is brought from underground. That the mine is and will be a valuable one, we have very little doubt. It is at present almost in its infancy; and all the works necessary for a large production of ores have not yet been completed, but these will be proceeded with at once, and when finished the shareholder who have visited the property, as well as the agents, express their confidence that it will be a profitable and valuable concern. Until this is done, however, silver in large quantities cannot be produced. The production at present is on a small scale, by means of a process of which Captain Doble has a provisional patent, and which is worked a short distance from the Queen Mine. The ore is first burnt with a proportion of common salt, whereby it is chlorodised, and it is then taken from the oven and put into two barrels, with some chemicals necessary for the purpose. This throws down the silver at a rapid speed in its metallic state, and then the quicksilver is extracted, containing silver in solution, which is filtered, and forms a solid amalgamation of silver and mercury, containing about 17 per cent. of silver. It is then volatilised in an iron retort; the mercury is thrown off, and the spongy silver is retained within the retort, and at this stage of the process contains about 70 per cent. of pure silver. The process is a very simple one, and the two barrels which are employed for the purpose have produced something like a thousand ounces of silver in ten weeks, 400 ozs. of which are from ores containing only 10 ozs. to the ton. These works, when first constructed, were simply intended as an experiment, but the result has been so successful that the shareholders have now determined on proceeding upon a larger scale, and we believe that in the new premises no less than 20 barrels will be brought into operation. Mr. Barnard states that 5 ozs. of silver to the ton produced in this way would leave a profit; but the experience of the past ten weeks on the Queen Mine has proved that the bi-products will more than cover the expense of extracting the silver, which will be altogether profit. Within the last month Mr. Kempe and Mr. Barnard have sold to Messrs. Venables, of London, bullion brokers to the Mint, 730 ozs. of silver which have been raised from the mine. This silver was 16 dwts. over the standard, and realised 5*s.* 4½*d.* per ounce, the standard price at that time being 5*s.* 1½*d.* Within the last fortnight some 60*l.* worth more has been raised and gone through the same process, and this was produced at yesterday's meeting and pronounced to be of excellent quality. Altogether the prospects of the mine are most promising, and seem fully to justify the confidence which those mostly interested have in it.

The meeting was held at the mine on Tuesday, when the chair was occupied by Mr. W. CRIPER, of Tavistock, and there were also present Messrs. W. H. B. Kempe, T. J. Barnard, T. M. Matthews, J. Sleman, W. Morcom, J. Legassick, E. C. Paine, London; W. Box, London; J. Wilcocks, J. Brownjohns, Bath; A. Snow, Isle of Wight; Capt. Knott, Capt. Doble, &c.

Mr. BARNARD first read the minutes of the meeting recently held in London, at which it was resolved, *inter alia*, that the capital of the company should be increased from 15,000*l.* to 20,000*l.*, for the purpose of affecting a necessary extension of the works on the mine; and that the additional shares, amounting to 5000*l.*, should be offered to the present shareholders *pro rata*, and Mr. KEMPE moved the confirmation of those resolutions. In so doing he remarked that, in spite of all that had been said to the contrary, he was so confident of the resources of the mine that he had not the slightest hesitation in asking the shareholders to sanction the proceedings of the London meeting. Already, with the small amount of machinery which they had at their disposal, enough had been done, in his opinion, to remove the doubts that seemed to have existed in certain quarters as to the value of the mine; but when the works were extended, as it was proposed to do, he had no doubt whatever that their expectations would be even more than realised. (Hear, hear).

Mr. PAINE seconded the resolution, which was carried unanimously.

Mr. WILCOCKS wished to know whether the present shareholders were at liberty to take up as many of the additional shares as they pleased, but Mr. BARNARD replied that this could not be, as it had been decided that they should be distributed *pro rata* amongst those who were desirous of taking them. He had himself, when in London, offered to take the whole 5000 shares, but he was not allowed to do so. Other parties were equally anxious to obtain them, for one gentleman alone had written for a thousand of the shares. This only showed what the opinion was respecting the value of the mine, of which he himself had never had any doubt.

The CHAIRMAN then read the report of the agent, Capt. Knott:—

"In laying before you the work done since the last general meeting, and the present prospects of the mine, I beg to say the 30 below the adit, east of the engine-shaft, has been extended 10 fms. 1 ft. 6 in. by the side of the lode, and the lode cross-cut in three places, varying in width from 18 in. to 4 ft., composed of quartz, capel, peach, intermixed with arsenic, silver-lead, and tin, containing of the latter from 30 to 40 lbs. of black tin per ton of stuff, and will average 10 ozs. of silver per ton. The lode in this end is worth 12*l.* per fathom for silver and tin, the average price for driving being 6*l.* 10*s.* per fathom; this is opening out profitable ground for stoping. In the 30 west a rise has been put up in the level 9 ft. high and 15 ft. long, and the lode in this rise is about 18 in. wide, composed principally of peach and quartz, and will yield 1 cwt. of black tin per ton of stuff, and from 10 to 12 ozs. of silver per ton; the lode in this level is worth 15*l.* per fathom for tin and silver, which can be stoped at a cost of about 60*s.* per fathom. This lode is also opened at the 20 some fathoms east and west of shaft, where the same is 18 in. wide, of similar composition, and containing ½ cwt. of black tin per ton of stuff and 12 ozs. of silver per ton, worth for tin and silver 9*l.* per fathom, and with the necessary stamping power, alluded to in a former report, and the aid of a more extensive amalgamation works, this lode can be worked at a good profit. I beg also to lay before you the prospect of clearing up the engine-shaft from the 30 to the 40 below adit, as No. 3 lode is 4½ fms. north of No. 2 lode at the 30, and these two lodes must of necessity form a junction between the 40 and 50 below adit, and both lodes being strongly mineralised and productive of silver, copper, and tin ores in fair paying quantities, it is an important point to be attained, and one where great and grand results may be reasonably expected, and at which point we are making preparations to explore with all possible dispatch.—Cook's Shaft: This shaft has been sunk on the course of the lode below the 10, under adit, 5 fms. 5 ft. 6 in., and is now 8 fms. 1 ft. 6 in. below that level; the lode in the present bottom is about 2 ft. wide, composed of peach, quartz, and capel, and highly charged with arsenic and copper. The 10, west of Cook's shaft, below the adit, has been extended 4 fms. 1 ft. 9 in.; the lode in this end has improved the last few feet driving; the lode in the present end is 2 ft. wide, and will yield 6 tons of ore per fathom, value 12*l.* per fathom; this level, east of shaft, has been extended 2 fms. 4 ft. 6 in., and a rise put up 5 fms. 0 ft. 3 in. to communicate with the level above for ventilation, and opening out ground for tribute. There are three tribute pitches working in the back of this level, by nine men, at an average tribute of 11*s.* 7*d.* in 1*l.*, the takers paying all dressing cost.—Silver Department: Bennett's eastern shaft has been sunk below the 5, below adit, 5 fms. 4 ft.; and the 10, east of Paul's winze, has been driven 5 fms. 2 ft., and communicated with the above-named shaft, thus affording good ventilation, and opening up good paying ground for silver; and the stopes in the back of this level have yielded silver ore in fair paying quantities. We have also secured Bennett's western shaft with the timber required between the adit and 10, and commenced sinking the shaft below that level, in the bottom of which we have a good branch of silver, and I have great confidence that the lode at this point will be highly productive of rich silver ores. In conclusion, I beg to say, considering the productiveness of the different lodes for copper, tin, and silver at such a shallow depth, and the prospects which nature holds out at the point of junction already referred to, coupled with the amalgamation process, and the economical and effectual mode of extracting the silver, both from high and low class silver ores, which is fully proved to be a success, this mine is destined to take first rank among the mines in this kingdom; and the day is not far distant when it will prove, by its sales of fine silver, tin, and copper ores, that it deserves the name by which it is called—the Queen." (Applause.)

The report presented by Capt. J. W. Doble, the amalgamist, was:—

Since the last general meeting we have treated about 25 tons of low-class silver ores, from which we have extracted 200 ozs. of fine silver. The total amount treated of the low-class ores since the erection of the model works has been about 50 tons, averaging 10 ozs. to the ton, from which we have extracted 400 ozs. of fine silver, or 8 ozs. of silver to the ton of stuff, being 80 per cent. of the silver extracted by the first treatment. The cost of extraction will average about 20*s.* per ton, leaving a profit of about 2*os.* per ton, or 100 per cent. We have also treated 8¼ cwts. of silver ore, containing 8⅛ ozs. to the ton, from which we abstracted nearly all the silver, being 355 ozs. We have likewise in treatment 2 tons 14 cwts. of moderate quality silver ore, containing 135 ozs. of silver to the ton, from which we are extracting 85 per cent. of the silver at the first treatment. The experiments already tried by our model works sufficiently warrant the assertion that all the ores broken from the lodes within the sett of the mine will pay for the extraction of the silver alone, but the utilisation of the bi-products and the extraction of the other metals will leave splendid profits to the shareholders, profits which will for a certainty be realised when the new and larger works now in course of erection are completed. The reason of the larger percentage of silver extracted from the higher class silver ores being obtained than from the low-class ores is that the latter class ores contain a much larger amount of lead and antimony than the higher class, thereby saturating the mercury with those metals as well as a portion of the silver, leaving a portion also of the silver in the treated ores.

These reports were unanimously adopted, after which Mr. Criper was re-elected managing director, Mr. Gibson was re-elected auditor, Mr. Robert Luxton solicitor to the company, and Mr. Barnard secretary. In proposing the re-election of Mr. Barnard, Mr. KEMPE remarked that he had been the life and soul of mining in the neighbourhood, and that had it not been for him they never would have been in the satisfactory position they at present occupied.

In answer to questions that were put to him, Capt. DOBLE stated that when the new amalgamation works were completed, if 300 tons of stuff containing 10 ozs. of silver per month were supplied to him he could give an average of 80.0 ozs. of silver per quarter from the low-class stuff, and that would leave a profit of 1000*l.* on the silver alone. (Hear, hear.) If twenty barrels were erected they would work 40 tons a day, and for that number of barrels forty heads of stamps would be required.

Mr. BARNARD: If that is the case there would be a clear profit of 4000*l.* a year without the bye-products paying anything whatever, and if 40 tons per day are got through something like 50,000*l.* or 60,000*l.* a year will be realised.

Mr. KEMPE asked whether the necessary amount of stuff per day could be brought to the surface in order to meet the anticipations of Capt. Doble?

Capt. KNOTT replied that this could not be done until more ground was opened up, and he would recommend that they should have stamping power, revolving gear, &c., so that the works might be increased. At the present time there were some hundreds of tons of stuff on the surface. Supposing for the sake of argument that the bi-products met only half the expense of extraction—there was reason to believe they would pay the whole—they could still extract 6 ozs. of good profit.

Mr. BARNARD added that 8 ozs. of silver would give 10*l.* per cent. without the by-products at all.

This concluded the business of the meeting, and a meeting of the King Mine shareholders was afterwards held, Mr. Criper again presiding. The agent in his report, after referring to the work that had been done, directed attention to a good copper and silver lode lying south. He says—"A junction of the north and south underlie lodes will occur at a very reasonable depth, at which point we may fairly and reasonably expect large deposits of ore; and from the productiveness of the lodes about and above the adit, and the character of the strata in which the ore is embedded, and with the aid of the amalgamation process for the extraction of the silver—which in bygone days has been considered or treated as valueless—I have no hesitation in saying, from the present prospects of this mine, it is highly probable that in a very few months even it will rank in the Dividend List." The amalgamist presented an equally satisfactory report. Looking at the great success which had been attained at the small amalgamation works in the extraction of silver from the low class silver ores raised at the Queen Mine, he had no hesitation in saying that large profits would be realised by the extraction of the silver from the ores which could be raised from the King Mine as soon as the water was taken out and ground laid open, leaving the other metallic ores as another source of profit to the fortunate shareholders in the mine.

The report was received and adopted.

The CHAIRMAN, in acknowledging a vote of thanks accorded to him for presiding, said they looked upon the King Mine as one of the best properties in the district. They knew very well that many of the lodes of the Queen Mine passed through the King sett; they knew, also, that a junction would be formed in that sett, and, as a positive rule in mining, wherever that was the case it would be sure to lead to profitable results. There were strong evidences to indicate that in another twelve months it would be one of the very best properties in the whole neighbourhood, for the stratification was good, the lodes were large and strong, and everything about the lodes tended to show that they would be productive when worked up. (Hear, hear.)—*Western Daily Mercury.*

[For remainder of Meetings see to-day's Journal.]

METALLIFEROUS DEPOSITS, AND UNDERGROUND TEMPERATURE—No. III.

Returning to Mr. HENWOOD'S account of the Charnarcillo district,* it appears that on passing from the cellular limestone of the Manto de Ossa into the compact rock beneath the lodes, diverging from their normal dip and inclining at a much lower angle, take their way for some distance between the two, but ultimately they resume their ordinary inclination. The several interferences of lodes are, even in the same neighbourhood, attended by inosculations, by simple intersections, and by displacements. Hitherto the Colorada is the only lode ascertained to cut a cross vein, and this through an inconsiderable vertical range. In all their interferences with cross veins, however, the lodes are heaved towards the left hand, and to the side of the greater angle. Neither of the lodes, and only one of the cross veins, interferes with the levels of the rocks in its opposite walls. In the exceptional case of the San Francisco viejo, the several strata which form its hanging wall are many fathoms below their respective counterparts in the footwall, the lodes suffering at the same time corresponding displacements.

The absence of water in the mines is as remarkable as it is at the surface of Chanarcillo, for mines have been opened to and wrought at a depth of more than 260 fathoms without the appearance of water. But if this absolute drought be beneficial in some it is at least as prejudicial in other respects, as it deprives the miner of cheap means of extracting his ores and separating them from the veinstones. The ignorance and prejudice of the native mine owner prohibits the use of the wheel-barrow, the windlass, and the kibble; all ore and rubbish are taken within the reach of horse-power or to the surface on the backs of labourers. Owing to these exceptional circumstances, and to the enormous cost of food and drink, much ore which might have been wrought to advantage now remains unbroken in the mine and undressed at the surface. All necessaries of life both for the people and for the animals they employ are brought on beasts of burden from considerable distances. Of the water, indeed, small quantities only are drinkable; the rest, like that of the river Copiapo, containing salts of soda in large proportions. The only water used in locomotive boilers on the Copiapo Railway is, in fact, obtained by distillation of sea water at Caldera and of river water at Piedra Colgada, any surplus being sold for household purposes. In 34 years more than 2,000,000 lbs. troy of silver were obtained from the Chanarcillo district. At Quebrada Seca, in Copiapo, foliated rocks of hornblende, quartz, calcareous spar, and felspar, more or less mixed with several other minerals, are frequently interlaid, although they are sometimes also intersected by bodies of quartzose, calcareous, and felspathic veinstone, unequally charged with earthy brown iron ore, as well as with native copper and various varieties of copper ore in smaller proportions. Trifling quantities of water in the deepest works are rich in salts of soda. At San Jose rocks of much the same character as those of Quebrada Seca are traversed by two series of joints, at the interferences of which masses of quartzose, felspathic, and hornblendic veinstones are largely impregnated with earthy brown iron ore, and thinly sprinkled with various ores of copper. Notwithstanding the surface of San Jose is covered with sand impregnated with the salts of soda, a shaft of 5 fms. in depth affords copious streams of fresh water.

Of the metalliferous deposits of Virginia and the Lake Superior district Mr. Henwood gives an abundance of interesting particulars; and with regard to New Brunswick, it is stated that the granite which for some distance forms the banks of the Big, Middle, and Little Nepisignit rivers, in the county of Gloucester, is intersected by a dyke of felspathic porphyry at Glendinning's Island, and by veins of quartzose granite near the falls of the Pabineau and at the Middle river. The slate series comprehends many beds of felspathic and hornblendic rocks, both of compact and of schistose structure; it consists, however, to a much greater extent of clay and chloritic slates. In different parts of the Middle river also felspathic and hornblendic slates overlie, alternate with, or are penetrated by veins of granite. For some distance below the falls of the Tattagouche chlorite abounds. Near the Narrows from the Middle landing to the Portage Brook, and at the Grand Fall of the Big river, and from 10 to 12 miles up the Middle river, the slates are more or less quartzose. Near the chain of rocks, and on the edge of the Grand Fall of the Big river, at the falls of the Little river, at the fall of the Tattagouche, at Armstrong's brook and Clarke's camp, felspathic and hornblendic rocks interlie the slates. Earthy brown iron ore occurs at the Red brook, the Narrows, and at the Middle landing on the Big river. Iron pyrites is obtained below the fall and at Daly's, on the Tattagouche, at Clarke's camp, and at Armstrong's brook, near the falls of the Little river, and at the Narrows. Copper pyrites has been observed in most of the same localities. Crystals of copper-glance are thinly sprinkled at the fall of the Tattagouche. Galena accompanies calcareous spar at Armstrong's brook. The oxide of mangenese is scattered through masses and veins of the quartz at the Tattagouche fall.

With regard to Jamaica, some districts of which were not long since in favour with English mining capitalists, Mr. Henwood states that in a low hill of hornblendic granite, on the eastern confines of St. Thomas in the Vale, a portion of the rock which in direction coincides with the joints of one series, and preserves a general width of 4 or 5 fms., is unequally sprinkled with small rough spheriods and other shapeless masses of copper pyrites, earthy black copper ore, specular iron, and earthy brown iron ore, frequently invested with malachite; for the most part these are isolated, but in some cases microscopic threads of copper pyrites unite them. A similar, if not the same, body of hornblendic granite, charged in like manner with ore of copper and iron, is traced for some distance in the adjoining greenstone.

The metalliferous deposits of Ireland appear to have received as much attention from Mr. Henwood as those of the other districts which he has visited. In Wicklow the homogeneous dark blue and variegated clay-slates which prevail in the south-west, but graduate into massive silecia-felspathic rocks in the north-east of the district of Ovoca, are interlaid by the "sulphur course," a metalliferous band, which, from Connorree in one to Ballymurtagh in the opposite direction, has been wrought from a width of 6 ft. to more than 70 ft. Throughout its entire range the shallower parts consist chiefly of earthy brown iron ore, sprinkled with iron pyrites, various ores of copper, and of several other metals. At greater depths iron pyrites becomes the principal ingredient, but at intervals it includes bodies of yellow copper ore; quartz, although less abundant than in most other metalliferous deposits, is often a large constituent; and slate, from mere microscopic specks to horses of several fathoms in length and depth abounds in almost every part. Auriferous silver has been found embedded in earthy brown iron ore at Cronebane, and thinly scattered in a state of extreme subdivision amongst the sulphur ore of Connorree. Gold occurs in both the earthy brown iron ore and the pyrites of Ballymurtagh, but in proportions far too minute to repay the cost of extraction. A striking peculiarity of the formation is that the iron pyrites, the copper pyrites, and the slices of slate which interlie them all display, as well in direction and dip as in degree, the selfsame schistose structure as the adjoining country slate; differences between the country and the veinstones, however, are more distinctly marked where they are bounded by joints and planes of cleavage. North-west of the principal metalliferous bed, but west of the Ovoca, a second similar broad band of ore has been largely wrought at Ballymurtagh. On both sides, yet within short distances of the great sulphur course, similar parallel beds containing large proportions of copper ore occur, containing larger proportions of copper ore.

One of these, the south branch in Connorree, although of much the same composition as the rest, maintains, like the main lode at Berehaven, a lower inclination than they or than the cleavage planes of the contiguous slates. Of three cross veins which intersect the great sulphur course in Cronebane and Tigrony, two heave it in opposite directions, but the effect of the third is yet unknown. Three cross joints traverse it at Ballygahan, and all heave it in the same way, but to unequal distances at different depths; at Connorree, however, similar joints occasion no displacement. The mine water is everywhere more or less impregnated with metallic salts; in one mine, indeed, to such an extent that the pumps were protected by wooden linings, and the plungers were also of wood. The precipitation of copper from such water by the immersion of iron was introduced at Cronebane about 150 years ago by a Cornishman who had become acquainted with the process in his native county; and from that time to the present it has been carried on in various parts of the neighbourhood. The precipitate is greatest in autumn and early winter, but it is deposited more rapidly in warm than in cold weather, and from running than from still water.

The Mine of Knockmahon, in Waterford, is for the most part wrought in variously coloured, yet generally homogeneous, slates; but in some of the works massive rocks have been observed. The lodes bear 30° to 45° west of north and east of south, and consist in great measure of quartz, quartzose slate, slate, slaty and felspathic clay, chlorite, and calcareous matter; near the surface they contain also small quantities of earthy brown iron ore, at greater depths iron pyrites, and several varieties of copper ore obtain, and the deepest works have been rich in copper pyrites; differences of composition, however, often characterise subordinate veins into which the lodes are sometimes divided by longitudinal joints. The lodes incline unconformably to the cleavage of the slate, but the ore and veinstone they contain dip beneath the sea, and have been largely worked there. At the Berehaven or Allihies Mountain Mine, in county Cork, the rocks consist mostly of siliceous and chloritic or talcose matter, unequally sprinkled with carbonate of lime and minutely veined with quartz; adjoining and within short distances of the lodes they assume pale buff or lilac hues, and a thick lamellar structure prevails; elsewhere they are blue and fissile. Three series of joints are common alike to the rocks and lodes. Notwithstanding the works have been opened to considerable depths in schistose rocks at less than a mile from the sea, the streams which enter them merely suffice for use at surface. The metalliferous deposits of Kerry and Meath, and the detrital gold of Wicklow, are likewise fully referred to; whilst the conclusion of the volume is devoted to the consideration of the metalliferous deposits of Great Britain.

The work altogether is one that will long be esteemed as a work of reference for the districts to which it relates, and one that will be alike valuable to the mining engineer and mine manager.

* "Observations of Metalliferous Deposits." By WILLIAM JORY HENWOOD, F.R.S., F.G.S., &c. "Observations on Subterranean Temperature." By the same author (forming the Eighth Volume of the Transactions of the Royal Geological Society of Cornwall). Penzance: William Cornish, Green Market.

ZINC AND ITS COMPOUNDS.

THEIR USES IN DOMESTIC ECONOMY AND MEDICINE.

By Dr. LEWIS FEUCHTWANGER.

This metal has of late years become one of the most useful articles in domestic economy, and for utility must rank next to iron. For manufacturing purposes where copper was formerly employed, zinc has now taken its place. The various manufactures of zinc, its castings and galvano-plastic productions, the household utensils and conveniences, such as baths and signs, also vessels for culinary purposes, for alloys, coating other metals, for the production of electro galvanic and electro magnetic instruments; also for galvanising iron, copper, and brass; as a substitute for lead in roofing houses; in place of bronze in casting statues and other objects of art, both on a large and small scale, this metal offers considerable advantages. The effect of zinc castings, whether with a surface of zinc or with another metallic coating, is of great interest, considering particularly their cheapness and comparative lightness, so as to be the means of forming cheap duplicates of objects of high art existing in the more costly materials of bronze or marble.

The use of zinc for preventing the oxidation of iron, its aptness for perforation, and its general application to domestic purposes, are all well known. It is obvious that on many accounts it may be advantageously applied to a larger extent, especially in cases where the unyielding character of iron, and the high cost of copper, present obstacles to their use. It cannot be doubted but that zinc will before long be employed for statuary and the casting of small groups of figures and ornaments. Among the late improvements in printing, zinc has lent its powerful aid. By the invention of zincography and heliography—the first refers to a process by which ancient or modern engravings, and also modern impressions and drawings, executed either with the pen or the pencil, are transferred to a zinc plate, and a peculiar ink is employed for the purpose—not only is a perfect fac-simile of the original thus obtained, and copies to any extent of this fac-simile are again produced, at an exceedingly moderate price and all of equal excellence; every kind of drawing can be executed in this ink, and it has, therefore, the great advantage that it enables artists at once to fix and reproduce their sketches, instead of having recourse to lithography, wood-cutting, or engraving on metal, and the most rapid and evanescent expression of an artist's thought may thus be corrected, without impairing the spirit of the original sketch in the process of transfer.

Heliography is one the latest inventions in photography, effected by transferring the picture obtained on the zinc plate and etching it by means of acids, and then exposing it for a time to the rays of the sun and submitting it to a secret process before printing. The picture on the frontispiece of my work on gems was thus executed in this city, and is pronounced a success.

Zinc has been known to the Chinese for a long time, and was brought to the notice of the Europeans in the sixteenth century. Native zinc in its metallic state is extremely rare. It has been found in a basaltic rock in Australia, near Melbourne, but it is found in great abundance when combined with sulphur, and called blende, or with carbonic acid, smithsonite. With silica it is called the silicate or electric calamine, on account of its being pyro-electric; when combined with oxygen it is the red oxide of zinc, usually found in foliated masses and of a deep red colour. It is found in connection with franklinite, which likewise contains zinc, iron, and manganese, in New Jersey, the only locality in the world. Zinc has also been detected in the vegetable kingdom, in a peculiar violet flower growing on the calamine hills of Rhenish Prussia.

Blende, calamine, and the red oxide are used for reduction in the

various works of England, Germany, Spain, Hungary, and the United States. The name blende is derived from the German word *blind*, a name given by the miners, as they were deceived when looking for lead and copper; they met with this ore, which they considered worthless. It is also called *black jack* by the miners. Besides the last-mentioned ores are a number of minerals found in many localities of the world, which contain more or less zinc in combination with other interesting substances, such as the following:—

A mineral, called Hopeite, found in the calamine mines of Aix-la-Chapelle on the Rhine, which is a phosphate of zinc.

Aurichalcite is a rare mineral from Spain, which contains zinc and copper.

Greenockite or cadmium-blende is often associated with zinc ores.

Goslarite, from the Hartz mountains, is a mineral consisting of the sulphate of zinc.

Kœttigite, a mineral from Saxony, contains zinc combined with cobalt and arsenic.

Hydro-zincite is also called zinc bloom, and is mostly found as incrustation in the zinc mines.

The metals which accompany the zinc ores without altering its physical character, are cadmium and indium. The first was discovered by Stromeyer in 1817, and the latter discovered by Reich in 1861, by means of spectrum analysis, as it imparts a blue colour to flame and its spectrum is characterised by two indigo-coloured lines. Both these interesting metals are only found in zinc ores, more particularly in blende. The localities of zinc ores are very numerous in every part of the world, and mostly in the neighbourhood of lead mines, with a few exceptions. In the United States zinc-blende, both yellow and black, as well as calamine, are fouud in great abundance in Maine, New Hampshire, Massachusetts, New York, New Jersey, Pennsylvania, Missouri, and Wisconsin; more particularly in the last five States, as also in Virginia, in Wythe county, where the calamine has been mined and exported to Europe.

The principal smelting works for the production of the metallic zinc called spelter, when brought to market in the form of inch thick plates, and in sheet form of various thicknesses, and in wire of various sizes, are in England, Belgium, Silesia, Hungary, Spain; and in the United States, in New Jersey (Newark), Pennsylvania (Bethlehem), Missouri, and Wisconsin. The methods applied for the reduction of the various zinc ores differ much according to the materials used in the work. Blende is mostly employed in Silesia, the carbonate or smithsonite in England, while in the United States the calamine and the red oxide are mostly used as reduction materials. The theory is very easily explained, and is based on the fact that zinc ores when exposed to great heat are very volatile, and easily converted into vapours, which are led into coolers, whereby they are condensed into solid metal. In Silesia, the process of reduction is pursued in the following manner:—The ores are roasted in large open furnaces for several hours, oxidation ensues, they are then transferred into muffles made of fire-clay, which are placed in a receiving furnace, previously, however, mixed with coal-dust. The muffles having the shape of retorts with necks, lead the rising vapours into small cooling vessels; there are ten muffles, which fit in one reducing furnace, and it requires 12 tons of coal to reduce 1 ton of the metal, at which operation 40 per cent. is driven off from the original weight of the ore.

The Belgian process is somewhat different; the operation being performed in earthen tubes of 3 feet in length, and 4 to 5 in. in width, which hold about 40 lbs. of the roasted ore; a cast-iron pipe is then attached to each tube, when after exposing them to the red heat in a large furnace, the metallic zinc condenses in them and is drawn off every two hours.

The English process is executed in covered crucibles, which are placed in a circular furnace, like a common glass furnace, which is heated by a single fire-place in the middle, but openings in the bottom, into which a conical tube of sheet-iron is introduced, to which end also a large sheet-iron tube is attached; in this the vapours of the zinc are condensed while being led into water. Coal is used in England, while coke is employed in Belgium for reduction. The crude zinc or spelter obtained by these various processes is not quite free from impurities and other metals adhering to it, such as lead, cadmium, arsenic, carbon, &c., all of which cannot be got rid of without another distillation; the crude metal has to be dissolved in a dilute mineral acid and precipitated by carbonate of soda, the precipitate mixed with purified lampblack, and then re-distilled in earthen retorts. The physical characters of zinc are the following:—It is a bluish-white metal, of a peculiar taste, and of perceptible smell when rubbed; of a crystalline structure, at ordinary temperature; brittle, but when heated to 130°, may be rolled out in sheets, and when heated to 300° becomes again brittle, so that it may be broken up and pulverised; it has a specific gravity of 6·8, and its equivalent is 32·99, and its symbol Zn; it fuses at 773°, boils at bright heat, and then volatilises; it takes fire in the presence of atmospheric air, and burns with a luminous greenish flame, which is the oxide of zinc, which was formerly called flowers of zinc, or philosophers' wool. When zinc is exposed to moisture it remains unaltered; for this quality it is so much used in the household for external purposes, such as roofing, business signs; galvanised iron, such as nails, spikes, chains, cables and ship furniture, which is effected by merely dipping those various articles in melted zinc, is in great use, as it protects them from rust, corrosion, and destruction. With tin and mercury it forms an amalgam and excites electricity; it is also used for obtaining hydrogen gas by means of sulphuric acid.

The most important alloys with zinc are brass; when some tin is added to the copper and zinc which forms the brass, it is bronze; when nickel is added to the mixture of copper and zinc, it is called German silver, which forms a beautiful white composition; while brass, bronze and other alloys form yellow compositions of all shades, from bright yellow to brown red. Zinc combines also with lead and tin, and hardens them; but does not harmonise with bismuth, and hardly with arsenic and antimony.

The importations of spelter and sheet zinc from Silesia, Belgium, and England are very extensive, as may be seen from the Custom House report of the city of New York, where it is stated that in the last three months were imported, of spelter alone, 130,173 plates, of 28 lbs. each. we may fairly compute the importation of spelter at three millions of pounds; of sheet zinc over two millions of pounds, and over two millions of pounds of oxide of zinc, or white zinc paint. In Missouri the spelter has been produced for a year past; also in Wisconsin, but not in sufficient quantities to interfere yet with the large importation. In Bethlehem, Pennsylvania, spelter has been manufactured in considerable quantities, which has been pronounced superior to the English and Silesian spelters. Sheet zinc has, to my knowledge, not yet been produced in the United States; it is extensively imported from the Vieille Montagne Works, in Liége, Belgium.

Sulphate of zinc, called white vitriol, is a mining product, a soluble salt, which crystallises in long prisms, and forms a series of double salts with alkaline sulphates. For medical or other chemical purposes, it is dissolved in water, boiling the solution with oxide of zinc, and then re-crystallising the sulphate. White vitriol is much used in the arts, and also in medicine, as a powerful emetic, particularly in cases of poisoning, where prompt action is indispensable.

Carbonate, acetate, iodide, bromide, cyanide and other salts of zinc are usefully employed in medicine, but not in the arts. The compounds of zinc are all poisonous, but not to the same extent as those of lead—sufficiently for the oxide of zinc, now extensively used in painting in place of white lead, to be capable of producing colic resembling that from white lead, and is called also the *colica pecterum*, for it attacks workmen exposed to the dust of the oxide, while engaged in packing it in barrels; it yields likewise to the same treatment as the lead-colic.

The alloys of zinc with copper and with nickel, and also that of copper and tin, deserve, on account of their great importance in daily life, more than a passing notice.

Brass, which is composed of copper and zinc, was formerly made from copper scraps of clippings and calamine, or from blende and charcoal; latterly the method of casting brass has been changed into the following mixture of 50 parts old brass, 50 granulated copper, and 25 zinc, melted in sand; or black lead crucibles about 16 in. deep are exposed to a white heat in the well-known air-furnaces for four hours, and the fleece brass poured out into iron moulds, with the precaution of stirring the mixture before pouring with an iron rake, in order to bring any light foreign matter to the surface; and instead of iron moulds granite blocks are used. Its composition will then be two equivalents of copper to one of zinc, or the formula Zn, Cu_2; but according to the various purposes for which the brass ingots are used, such as either for transforming in sheet brass or wire, the proportions are altered; a little iron hardens it and diminishes its tenacity and malleability; tin renders it harder and stiffer, even ½ per cent. alters its ductility; lead imparts to brass a harshness which renders it suitable for the lathe.

The gold-yellow colour of brass and the various proportions of zinc changes its colours; tombac is a red brass, and contains 82 per cent. copper and 18 per cent. zinc; and Dutch metal, or foil, or spurious gold leaf, which is a pale yellow brass hammered out into thin leaves, contains a small portion of zinc; the Lyons and Sporzheim gold wrought up in jewellery is nothing but brass, but subjected to a peculiar treatment, which consists in heating thin copper bars or wire in earthern tubes with zinc—the fumes of the latter boring the copper externally.

Brass solder is prepared by two parts of brass melted with one part of zinc. Brass when tempered diminishes in density and increases in bulk in proportion to the copper, and has a specific gravity of 8·20 to 8·95, and it expands from 32° to 212°. Good brass melts at twice the temperature of red-heat, which is about 1869°.

Bronze, which is an alloy of copper with tin and zinc, is generally known by the name of antique and modern bronze—the former consisting of copper and tin, while the latter contains also the zinc, and sometimes no tin at all, so that modern bronze is but a brass with an excess of copper. Bronze when exposed for a length of time to atmospheric agents assumes a peculiar greenish or olive hue, arising from the formation of a basic hydrated and carbonated oxide of copper.

This colour is very attractive; for attaining this result many experiments have been made. Generally any salt of copper dissolved in water or weak acid is applied to the surface with a brush, or the objects are immersed in the solution in which parts of verdigris and one part sal ammonia are dissolved—vinegar, fine oxalate and nitrate of potassa with blue vitriol are likewise used for the purpose; the tint of colours my be varied by the mixture of saltpetre, common salt, and sulphuric acid. A solution of palladium—chloride and black lead and peroxide of iron has been successfully employed for bronzing, which is said to produce a fair and permanent colouring.

Argentan, or German silver, is the other alloy above alluded to. It is said to have been manufactured in China under the name of Packfong, in German since 1824, and in this country was first introduced and manufactured by me in 1833 from the copper nickel. This alloy is composed of copper, nickel, and zinc in certain proportions, varied in whiteness or softness according to the uses for which the composition is intended. The proportion which I used for a white and soft metal to roll out into sheets was 50 per cent. of copper, 25 per cent. of nickel, and 25 per cent. of zinc. In order to prevent any loss of zinc by volatillisation, it is well to mix the same with the copper, which is put on the bottom of the crucible, and the nickel on top, so that when the red-heat begins to soften the copper, the nickel, which is more refractory, also becomes soft, and melts.

The quality and adaptation of German silver vary with the proportion of the metal and the purity of the nickel. I have teaspoons, which have been used in my house since 1835, and look like old sterling silver. Examine these pennies, of which I issued in 1837, with the permission of the United States Government, over 1,500,000 pieces, made with the properties above given, and you will acknowledge that this composition challenges the silver for wear and durability, for the nickel penny, which contains but 12 per cent. of nickel, has more the appearance of old brass.

German silver is now very extensively used for spoons, forks, and other domestic utensils, and as castings for philosophical, mathematical, and surgical instruments, gun mountings, harness and carriage furniture, &c. If the nickel is pure, the composition will wear very well; it should, however, not be used in vinegar or with acid fruits, and its surface should always be kept clean and bright. It is far less likely to prove injurious than articles of copper and brass, and it may well be substituted for them.

Dr. Feuchtwanger's lecture was illustrated by specimens of the Heligraphic art, of metallic zinc, cadmium, and metallic indium of brass and bronze. His German silver cent, issued in 1837, resembled a sterling silver old coin. Of the minerals containing zinc, such as the blende, calamine, smithsonite, aurichalcite, and the red oxide of zinc, and of the most important chemical and medicinal preparations, such as the white oxide of zinc or zinc white, the chloride of zinc or Sir William Barrett's liquid, sulphate of zinc or white vitriol, acetate, carbonate, and bromide of zinc.

—*Engineering and Mining Journal* (New York).

SEPARATION OF SILVER AND LEAD.

By C. S. EYSTER, Denver, Colorado.

I have been delayed in sending an account of my process for separating silver and lead at an earlier period, from the fact that from want of proper apparatus I was unable to make any experiment until recently. I now give you the result—first giving a description of my apparatus, then the mode of the operation, and its result. The cylinder which I first experimented with was only 9 in. in diameter—the one I now have is 15 in. in diameter, and 3 in. in length on the inside—that is, from head to head. The principles which underlie my process are:—

1.—That metals when in the metallic state do not enter into chemical combination when mixed or alloyed together.

2.—That metals when alloyed and reduced to a fluid condition, and kept at rest in that condition for a considerable length of time, say an hour or more, in a deep vessel, will become partially or approximately separated, according to their respective specific gravities. A familiar illustration of this is to be seen in a brass foundry—brass, being composed of copper and tin, if kept at rest in a molten state for an hour will so completely separate as to destroy the quality of the brass.

Another well-known instance of the same transposition is this:—If silver and gold be mixed, reduced to the molten condition, and kept in that state for an hour in a narrow and deep crucible, and then allowed to cool without agitation, most of the gold will be found at the bottom of the crucible, and most of the silver at the top. This result is accountable for, on the principle that when these metals are reduced to the fluid condition by heat their atoms are free to and do arrange themselves according to their respective gravities. When these metals are mixed and fused each atom of each metal retains in its atomic state all of its properties and chemical characteristics. It would require too much space for me to go into detail on this subject, and I content myself with simply stating the general principles.

If when metals are thus mixed and in fusion you employ mechanical force to assist their natural tendency to separate, you will accomplish that result in proportion to the force applied. The force which I apply is centrifugal force, generated by the rapid rotation of a hollow iron cylinder, in which the molten metal is placed for that purpose. The cylinder I now have for experiment is made of cast-iron, ¾ in. thick, 15 in. in diameter inside, and 3 in. thick—that is, from head to head; so that the cake or ingot of metal after treatment will be of these dimensions. The cylinder is cast with one of its heads attached. In the other end is a flange, 2 in. wide, on which the other head of the cylinder is fitted, so that it may be put on and taken off at pleasure, by means of bolts and keys or screws. This flange, and the head that fits on it, must be made so that the joint will be close, and so constructed that it may be luted, and made perfectly close or tight when it is put together for use. From the centre of each of the cylinder-heads protrudes an axle, cast with it, and made strong enough for the purpose, on which the cylinder revolves. On the top or circumference of the cylinder is a hole, about 1 in. in diameter, through which the cylinder is charged with the molten metal, and which is opened and closed with a screw, or other appliance, so as to be perfectly close. On one of the axles is fitted a spur-wheel, by means of which the cylinder is made to revolve. I have a bed-plate, cast with journal-boxes, on which this cylinder is to be placed when ready to be operated. This bed-plate is placed on the top of a small furnace, of sufficient capacity to generate heat enough to keep the cylinder as hot as the metal to be treated.

I place the cylinder in its bearings over the furnace, make up a small fire, and revolve the cylinder slowly over it, so as to heat it up to the temperature of the metal to be treated. I then open the vent on the top, pour in the metal to be treated, close up the vent, and commence to revolve the cylinder at the rate of about 250 or 300 revolutions per minute, keeping in the furnace just heat enough to keep the cylinder hot and the metal within it in fusion. After I have revolved the cylinder thus for three hours I withdraw the heat, keeping up the rotation until the cylinder is cold, and the metal within it solidified. (This will be accelerated by a blast of cold air blown into the furnace.) I then lift the cylinder from its bearings, take off the movable head, and turn out the cake of metal, when I find the lighter metals in the centre and the heavier ones on the outside, so that they may be cut apart in a lathe, or by any appropriate instrument. I do not claim that this process will make an exact separation unless, perhaps, when there were but two metals, when one might be cut pure from the inside and one pure from the outside, leaving an intermediate ring or band, to be treated again with others of like value.

Having thus described my method, I will now give the result of two experiments which I made recently, one in the small cylinder with very rich lead, and one in the large cylinder with very poor lead. The first experiment, as I said, was with very rich lead—according to assay it contained $1100 to the ton. It was made in the small cylinder. I melted 60 lbs. of this lead, containing about $33 of silver. I added to it 9 lbs. of zinc, and, after heating my cylinder to the temperature of the molten metal, or a little more, I opened the vent on the top, and poured in the metal. Closing the vent, I revolved the cylinder slowly for a few moments. This is done to mix the silver, lead, and zinc. I then stopped the rotation, and allowed the cylinder to stand for 10 minutes. This I did to enable the zinc to come to the top mixed with the silver, which it will do by reason of its specific gravity. I then turned the cylinder rapidly half round, so as to throw the zinc to the bottom, whence it would again ascend to the top, by leaving the cylinder at rest for ten or fifteen minutes. This may be repeated three or four times, as by such manipulation, and a very slow motion of the cylinder, I obtain a most intimate mixture of the zinc with the mass, and thus bring it in contact with all of the silver in the mass, which the zinc, by its superior affinity, takes up, reducing the gravity of the silver to the mean between that metal and zinc, making it about 8½, and leaving the lead at its original gravity. After I had thus treated it, I commenced to revolve the cylinder at the rate of 300 revolutions to the minute, and continued its motion at that rate for 2½ hours, keeping up heat enough in the furnace to keep the metal in fusion. At the end of the 2½ hours I withdrew the fire and cooled the furnace with water keeping up the rotation of the cylinder at the same speed until it was cold and the metal within it solidified. I then lifted it off from its place, took off the head, and turned out the ingot, which was 9 in. in diameter and 3 in. thick, with a hollow core in the centre.

By means of concentric circles I divided this mass into eight rings, which I numbered, commencing with the outer one. A small section across all these rings, in the direction of the radius of circles, was taken for assay to the mint, and gave the following results:—

No. 1 contained	1·7	parts of silver.		No. 5 contained	519·	parts of silver.	
2	,,	8·	,,	6	,,	545·	,,
3	,,	11·5	,,	7	,,	553·	,,
4	,,	263·	,,	8	,,	624·	,,

These are the mint figures, and show, as you see, a concentration of 624 to 1·7·10. It illustrates also the principle in the gradual increase of silver from the outside to the inside. A few pounds more of zinc added to this experiment, and a longer period of rotation, would, I have no doubt produce a much more decided result.

The second experiment was with the 15-in. cylinder, and with 180 lbs. of lead containing $20 of silver per ton.

This experiment was prepared exactly as the former one. I heated the cylinder up to the proper point—that is, the temperature of the molten metal. I then poured in the melted metal, adding to it 5 lbs. of zinc, and mixed, as before stated, by slow motion and stopping the cylinder. I then commenced to revolve the cylinder at a rate of from 250 to 300 revolutions per minute. I kept this up for three hours, keeping at the same time heat enough to keep the metals melted. At the end of three hours I withdrew the heat, and kept up the rotation of the cylinder at the same speed until it was cold and the metal solidified, when I stopped it, took off the cylinder, took off the head, and turned out the ingot of the same shape as that from the first experiment, but of larger size. In this instance the metal was divided in the same manner as before, but the number of rings was increased from eight to fourteen.

Fifteen grains from No. 1 gave so small a speck or point of silver that it was with difficulty it could be seen in the cup with the naked eye. Prof. Schirmer said it was not more than would be in the same quantity of litharge. He says practically it amounts to nothing. The others gave the same results up to No. 12, which had an appreciable quantity; No. 13 a little more; No. 14 quite a respectable globule. We did not weigh them, as I was desirous to keep them in the cupels for exhibition to friends, as out of the cups none of them could have been weighed in the most delicate scales, except Nos. 13 and 14.

All the experiments which I have made produced similar results, and I am now fully satisfied that every succeeding effort which I make will produce the same result. Indeed, when I have an engine or other force to drive my machinery, so that I can continue the rotation of the cylinder for six or seven hours, the result will be a perfect one. I now desire to procure a wrought-iron cylinder of the capacity of from 1200 to 2000 lbs. With this apparatus and this mode of treatment, I feel confident that I can concentrate the silver that is in 1 ton of lead into 100 lbs., at an expense of less than $5 per ton, thus saving the expense of cupelling 1900 lbs. of lead.

The zinc to be used in the process is to be distilled from the solid metal, converted into metallic zinc, and used over again in a similar succession of processes, so that there is no loss. We find no trace of zinc in the samples outside of No. 12.

When I speak of the cost of concentration a ton of lead, I speak with reference to the cost of working an establishment of the capacity of 5 tons per day. All the hoisting and lifting of cylinders would be done by means of cranes and pulleys, and the cutting of the concentrated metal by means of an upright lathe with an adjustable cutter. Four men and 1 ton of coal would treat 5 tons per day with great ease.—*Engineering and Mining Journal* (New York).

FOREIGN MINING AND METALLURGY.

Dortmund letters state that the coal and iron trades of that district have not varied much during May. Prices have not experienced much modification, and transactions of importance have been few and far between, except some great deliveries of coal for railways. The interest of industrials and of capitalists who have embarked in industrial enterprises is principally concentrated just now upon the results obtained last year, which are reflected in the dividends which certain companies are now paying to their shareholders. Collieries which in past years paid little or no dividend have been yielding good results for 1870, and better dividends still are hoped for in 1871. The demand for rough iron is now so great in Germany that prices have materially advanced since the signing of the preliminaries of peace.

Advices from the Ruhr district state that the close of the war and the commencement of summer have opened out an era of great activity to the coal mining and metallurgical interests of that district. The chief complaints which are now heard arise from the delays attending the return of the soldier-workmen formerly employed in the district from the theatre of war. Having regard to the favourable prices current for coal—rates hitherto unknown—it is clear that the coalowners will endeavour to carry their production to the maximum amount. As a great demand is anticipated for coal and coke, especially for the purposes of metallurgical industry, there is nothing in this tendency in affairs to excite uneasiness. As regards the metallurgical establishments, they have such an abundance of orders on hand that they are obliged in concluding transactions to stipulate for very long periods for delivery; and in the case of important contracts to refuse them altogether. This is especially the case with the engine factories and foundries. The rolling-mills producing rails are, however, in a less favourable position, and their owners would not be sorry to see the railway companies decide on putting some important contracts in adjudication.

The Belgian coalowners have again been disappointed. Scarcely were they justified in anticipating a revival in business, which the re-opening of the Parisian market promised to render very active and profitable, when a notice issued by the Northern of France Railway Company announced the suspension until further orders of the conveyance of coal to Paris. The hopes cherished have thus been once more deceived. There are also great and general complaints of the small quantity of rolling-stock which the administration of the Northern of France system puts at the disposal of industrials. To remedy this difficulty, the administration of the Belgian State lines has sent into the basin of the Couchant de Mons as large an amount of rolling-stock as possible. If we may credit the coalowners, rolling-stock on the Great Central system also makes default. These complaints as to want of rolling-stock seem not only periodical but chronic, and the wonder is that industrials do not endeavour to remedy the difficulty by furnishing rolling-stock themselves. Coal for industrial purposes is in good demand, and is regularly disposed of both on Belgian home account and also to French establishments. There are some rumours as to a probable increase in the extraction, as the orders given out seem likely to grow in importance.

Great dissatisfaction has been caused in the Charleroi basin by the refusal of the Belgian Government to grant a concession of a line from Athus to Givet. This line is regarded as indispensable to the Charleroi forgemasters, who require to supply themselves at a low rate with the minerals and minettes of the Luxembourg. The general condition of the Belgian iron trade has undergone but little change. The ironworks and rolling-mills are well provided with orders, and continue actively employed. The construction workshops are also generally well occupied. Two important companies for the construction of railway plant have taken recently a contract for goods trucks and passenger carriages for the Turkey in Europe Railways, and the terms are stated to be fairly remunerative. It is also stated—although the rumour requires confirmation—that the Eastern of France Railway Company has given out an order for plant and another for rails. Contracts for plant for certain Hungarian lines will be let on the 10th proximo, and are already attracting some attention in Belgium. These contracts will embrace 20 locomotives, and 400 trucks of various classes. The locomotives will be of four different types. A contract for 2000 tons of iron water-pipes required in connection with the water supply of Rotterdam has been taken by Messrs. Stokvis and Co., of that city. The Royal Asturian Mines Company will pay July 1 a dividend for 1870, or 1*l.* per share. The Sacré-Madame Colliery Company has fixed its dividend for 1870 at 4*l.* 12*s.* per share.

An increase of business in copper has been noted at Havre, where scarcely anything has been doing for some time past. In Germany, also, the various markets show a better tendency, and transactions are becoming more regular. Even those metals which are the most

neglected, such as zinc and lead, maintain their prices, holders relying on an early revival in business. In Holland tin has risen 1 fl. to 1¼ fl.: transactions were recently reported in Banca at Rotterdam, at 75¾ fls. to 76 fls.; but under the influence of the advices received from England quotations have since been carried to 77 fls., and that price has been paid for 500 ingots. The business passing in Billiton has been very small, as there is scarcely any tin of that description on the market. At Havre, Chilian copper in bars has made 68*l.* to 69*l.*; ditto in ingots, 78*l.* to 80*l.*; Peruvian minerals, pure standard, 71*l.* to 72*l.*; United States (Baltimore), 76*l.* to 78*l.*; ditto, Lake Superior, 80*l.* to 86*l.*; Mexican and Plata in bars, 66*l.* to 68*l.*; old yellow copper, 40*l.* to 44*l.*; red ditto, 62*l.* to 66*l.*, &c. At Marseilles, lead in saumons, first fusion, has realised 17*l.* 14s.; ditto second fusion, 17*l.* 6s.; ditto argentiferous, 17*l.* 12s.; lead in shot, 20*l.* 8s., and rolled and in pipes, 20*l.* per ton.

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

GOLD.—That gold exists in payable quantities in the colony is no longer a matter of dispute; but as yet the discoveries have not been extensive enough or permanent enough to lift the interest into one of very great magnitude or importance. The old idea that South Australia possessed none of the precious metal has been exploded; but the new idea which took its place—that we should speedily outvie the Dorados of Victoria and California—is still in the region of Utopia. The Warden's report shows that the results of the past quarter have been moderately satisfactory. The most important event has been the discovery of gold at Uloolo Creek, some 30 miles north-east of the Burra. According to the opinion of Mr. W. J. Peterswald, the Warden, there is a large area of gold-bearing country in the neighbourhood of the Uloolo; and from its geological features, as well as the character of the gold obtained, he regards the find as surpassing in its prospects any other that has been made in the colony. In this his view is confirmed by our special correspondent, who visited the discovery some short time ago. The gold fields in the immediate neighbourhood of Adelaide have not it appears been so prosperous of late. Many of the diggers have been called off to attend to harvesting operations, but they are now returning to their mining work, and by vigorously prosecuting it they may during the coming winter develope some good prospects.

THE MOONTA.—The operations of the company are being carried on as extensively as ever, and the results continue to be exceedingly satisfactory. During the past six months no less than 9018 tons of ore have been raised, or within thirteen tons of the quantity produced last half-year. But while the total yield is slightly less, it is more than counterbalanced by the increased richness of the metal, which returns an average of 19 per cent. of copper as against 17¾ per cent. of the preceding six months. This, together with the improved position of the copper market at home, has benefited the company to the extent of some 2000*l.*, but, added to this, some savings have been effected in bags, insurances, exchange, and other matters through an arrangement entered into with the Wallaroo Company, so that the net profit stands at 25,662*l.*, as against 18,436*l.* last half-year. The value of copper is set down at 9*l.* 5s. per ton, which multiplied by 9018 tons, gives a gross revenue of 83,416*l.* 10s. Against this come the working expenses, which amount to 57,754*l.*, 6*l.* 8s. 1d. per ton, leaving an actual gain of 2*l.* 16s. 11d. per ton, against 2*l.* per ton for the previous six months. The directors have paid one dividend of ten shillings per share, amounting to 16,000*l.*, out of the realised profits of the half-year, and on April 6 another to the same amount was declared. In addition to this a sum of 4918*l.* has been expended in the purchase of machinery for the mine. The report of Captain Hancock is most favourable—satisfactory alike to the shareholders and the public. There appears to be no diminution in the productiveness of the mine, and the prospects of the future are very satisfactory.

THE BURRA BURRA.—The 26th annual report of the directors of the South Australian Mining Association contains encouraging information. It state that "the various works designed by Mr. Darlington for carrying out the system he recommended for open working of the cuperous ground in the Burra Burra Mines are now so nearly completed as to allow of some of the orey stuff being at once removed, with the prospect, within an early period, of large quantities being taken to the dressing-floors." The profit and loss account shows a net credit balance of 17,905*l.* 16s. 5d., after deducting the expenses of the establishment since March, 1869, the cost of the works recommended by Mr. Darlington, and making allowance for the difference between the estimated and the realised price of copper. The Association's total assets amount to 79,534*l.* 7s. 6d., and represent 61,600*l.*, the proposed future capital, 17,905*l.* 16s. 5d. the balance of profit, and 28*l.* 11s. 1d. due sundry creditors. The actual cash funds available for carrying on the future works exceed 10,000*l.*, and the sum is considered ample for the purpose. The operations of the next year will be watched with a great deal of interest both by the shareholders and the public generally.

DIAMONDS IN THE FAR NORTH.—We were shown on Thursday by Mr. Dove what appeared to be a very fine clearly-cut diamond, which he had just had set in a gold ring. It was, he states, discovered about 700 miles north of Adelaide by a police-trooper, who it is reported has found several diamonds in the same locality.—*South Australian Register.*

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—The Superintendent (Adelaide, April 24) states—The reductions in every direction are now beginning to take effect, and the improvement in the copper market is still further assisting me. The new shaft is down nearly 34 fathoms; during the past three weeks the ground has been very hard, but is now getting easier again. We fully expect to be at work on the sulphur ores in July. Captain Terrell reports, under the date of April 15—Blinman Mine: The stopes between No. 3 shaft and No. 1 winze, and also those above the 10 fm. level, are much the same as last reported. The whole of the engine, except the boilers and pumps, is now on the ground, and the erection of the engine-house progressing rapidly. The wood is coming in a little faster, but not in sufficient quantities to keep two furnaces going; the low price (8s. per ton) has, however, enabled me to stack a little green wood, and as soon as this is sufficiently dry for use I shall put on another furnace. We have had some splendid rains, and there is every prospect of another good season. We have again let the cartage of the copper until December next at 2*l.* 10s. per ton, and the company's up-loading at the same rate. Ore raised and smelted 98 tons, copper made 11 tons 6 cwts. The quantity of copper made is very small, but I can assure the directors that I am doing all I can to keep down expenses and to keep up the returns until we reach Hill's lode.

PORT PHILLIP AND COLONIAL (Gold).—The quartz crushed during the four weeks ended March 29 was 5181 tons; pyrites treated, 30 tons; total gold obtained, 1379 ounces, or an average per ton, including pyrites gold, of 5 dwts. 7¾ grs. The receipts were 5263*l.*; payments ordinary, 3913*l.*; firewood, &c., account 1440*l.*; total 5353*l.*; loss, 90*l.*, which, deducted from last month's balance of 1910*l.*, left an available balance of 1820*l.* The sum divided between the two companies was 1000*l.*, the Port Phillip Company's proportion of which amounts to 650*l.* The balance of 820*l.* was carried forward to meet balance of firewood, &c., contracts. The return for the three weeks ended April 19—was quartz crushed, 3828 tons; pyrites treated, 25 tons; total gold obtained, 980 ozs., or an average per ton, including pyrites gold, of 5 dwts. 3 grs. Remittance, 600*l.* The company have also received the following telegram, dated Galle, 10th inst., in anticipation of the mail leaving Melbourne May 21 and due here July 8:—"Month ended April 26, yield per ton, 5 dwts. 8 grs. Two weeks ended May 10, 5 dwts. 20 grs. Remittance 600*l.*"

SCOTTISH AUSTRALIAN.—The directors have received advices from Sydney, dated April 19, with reports from the Lambton Colliery to the 18th. The sales of coal for the month of March amounted to 11,423 tons.

YORKE PENINSULA.—The directors have advices from the committee of inspection at Adelaide, dated April 22, with reports from the Kurilla Mine to the 21st: The work of driving through the unproductive ground at Deeble's shaft was being proceeded with.—Capt. Anthony reports: "The 25 is being driven west by four men, at 7*l.* per fathom; the lode is 4 feet wide, composed of quartz, pyrites, and black copper ore, but not enough of the latter to render it marketable. The 15 fm. level is also driving in the same direction by four men, at 8*l.* 10s. per fathom; the lode is small, and although it is not destitute of ore, it is of no value. . . . Although no rich deposit of ore has been discovered during the month our prospects are not worse, but rather better. The 25, west of Deeble's, is a most promising point, and I can but believe that even now we are passing over rich deposits of ore underlying the pyrites. I hope too, that as we get into the micacious strata, a few fathoms further west, there will be a change for the better."

AUSTRALIAN UNITED (Gold).—The directors have received the following letter from Mr. Lamb, dated Fryerstown, April 22. He writes—"I have pleasure in informing you that the expectations expressed in my last letter respecting the quality of the quartz we were sinking upon have been quite realised. Clearing up on the 15th, from 192 tons, gave 66 ozs. of retorted gold—about 7 dwts. per ton, or about 260*l.*, at a cost of rather less than 100*l.* I am also glad to say that our plates look well for two weeks' work. We are, so far, unable to go on with the 262 ft. cross-cut, or do any work in Lamb's shaft, without remittances from home. Could we drain Lamb's shaft, and drive under the quartz we are now sinking upon, our supply would be very large, and easy to raise, sufficient, at any rate, to keep our four batteries in full work. Hitherto we have kept three going, and the fourth with tributers' stone. The latter is being cleared up to-day, about 100 tons from the 135 ft. level, Dauke's shaft, and looks like 3 dwts. per ton. A little more energy and faith among the shareholders at home and they might yet have a valuable mine. I trust it is not too late. Mr. Kitto is writing you details of business."—[The letter referred to from Mr. Kitto has not yet been received at the office.]

CALIFORNIA NEWS.—During the week ending April 22 there were shipped from the works of the Owens Lake Company 482 bars, weighing 39,420 lbs. During the week ending 30th, there were shipped from the furnace of V. Beaudry, at Cerro Gordo, 1925 bars of bullion, weighing 161,700 lbs.—The East Eureka (English) Company, which now owns the O'Connor Mine, although its organisation is not yet complete, has commenced work in earnest. The mill is to have 20 stamps, and everything will be first-class. The castings are the heaviest of the kind ever made in San Francisco. It will be ready for work by July 1.—Greene and Co. run 20 tons of quartz through the mill last week, and without cleaning their batteries took out $8000 in melted gold, making $400 per ton. This makes about $22,000 in gold taken from some 32 tons of quartz with this 4-stamp mill in less than ten days' work.—On Tuesday a company of Portuguese miners working a claim near Columbia found a piece of quartz weighing 8 lbs., 4½ lbs. being gold, and is worth fully $1000. The same claim had been worked by Capt. W. A. Eakin who recently sold it to the Portuguese.—The Smartsville Hydraulic Mining Company sent down to this city amalgam valued at $54,000, the proceeds of a clean-up during the past week, after a run of between three and four months.—The richest and largest body of ore ever found in Lander Hill has just been laid bare in the 250 ft. level of the Oregon shaft of the Manhattan Company. Some miners who took a contract to run a level of 50 feet, started at a point where no ore was in sight, but soon struck a 3-foot ledge of $600 ore, which has maintained its size and richness to the end of their contract.

NEVADA.—Frank Brown and others, owners of a mine in the neighbourhood of the Bowery, lately commenced work, and in a little over one week developed a ledge as rich as anything in the district. A week ago $100 would have brought any one's interest in the mine, but since then $2000 has been refused for a fifth interest.—On Monday John Cahill showed us a silver button, three-fourths of an inch in diameter, which was produced from 1 oz. of ore from the Bowery Mine. The ore assays $14,677·55 per ton.—Wells Fargo and Co. shipped on the 6th by way of Salt Lake, for the Meadow Valley Company, bullion valued at $9,382·66, and for the Raymond and Ely Company $916,327; total $18,845·93. On the 8th and 10th, for the M. V. Co., 8 bars value $9,558·94; for the Raymond and Ely 11 bars, value, $15,020·65: total, $24,579·58.—The Eureka Consolidated Company will put their two new furnaces at work next week. When the five are in blast they will reduce 100 tons of ore to bullion every 24 hours. There is no district in America that is producing as much lead bullion as Eureka, nor are any of them producing as high grade in silver.—The Bullwhacker Mine has been sold to Messrs. Bernard and Sharp for a larger figure than any mine has been sold for in the district. The original discoverers have kept their property and developed it, and now they get enough for a year of labour to enable them to live in affluence the balance of their days. The new owners will at once erect a furnace and put on a large force of men.—At Chollar Potosi during the week there have been extracted 1810 tons of ore, and 1711 sent to the mills. The average assay has been $65·20. The company yesterday shipped $38,000 in bullion.—At Crown Point the usual ore is being extracted. The ore bodies on the 1100 and 1000 foot levels are looking as well as ever. The receipts for April were $180,507·44. There were crushed 4922 tons, yielding at the rate of $36·65 per ton. The disbursements amounted to $87,000, leaving a profit of $93,000.—*Scientific Press* (San Francisco).

FOREIGN MINES.

DON PEDRO NORTH DEL REY (Gold).—Telegram from Lisbon—Produce for April, 4984 oits.; produce to May 18, 1770 oits.

EXCHEQUER (Gold and Silver).—May 15: During the past week the north drift from the 140 was driven 12 feet. I am also running a drift east from the upper tunnel, 104½ north of the winze, which is now in 10 feet. I had run only a few feet when I struck a seam of quartz about 8 inches wide, which gave me the extraordinary assay of gold of $2542·4, silver (only) $5·16: total, $2547·57—equal to 534*l.* 17s. sterling per ton. I am still cross-cutting, but will run on this seam in a few days.

CHONTALES (Gold).—Mr. Belt, May 6: We have now ready to stope at San Benito east and west an immense body of auriferous ore, the lode being 17 ft. wide at the one mine and 14 ft. at the other, which with sufficient machinery will enable us to treat 4000 tons of ore per month from these mines only. Gold returned for April 481 ozs. from 818 tons of ore; average produce, 10 3-10ths dwts. per ton; value, $3271; cost for the month $5106, leaving a profit of $1165, or equal to 233*l.* sterling. The out-put of ore would have been greater but for the Easter holidays causing a loss of eight days to the stamping

— J. Tonkins, W. Evans, May 4: San Antonio Mine: No. 1 stope, in the back of No. 6 level, has been stoped 48¼ varas; lode 6 ft. wide, worth 3 dwts. of gold per ton. No. 2 stope, in the same level, has been stoped 62 varas; lode 5 ft. wide, worth 10 dwts. of gold per ton below and 15 dwts. per ton above the connection level. A stope in the back of No. 5 level has been stoped 100¾ varas; lode 3 ft. wide, worth 12 dwts. of gold per ton. The deep cross-cut has been driven 3¼ varas; the ground is still hard and difficult for driving. The No. 6 level has been driven west on the course of the lode 11 varas; the lode is 3 ft. wide, producing a little gold, but not sufficient to value.—Santo Domingo Mine: The rise at this mine has been put up 6 varas; lode 3 ft. wide, worth about 3 dwts. of gold per ton. A stope in the back of No. 3 level has been stoped 42 varas; lode from 2 to 3 ft. wide, yielding 6 dwts. of gold per ton.—San Sebastian Mine: The level has been driven east on the course of the lode 49 varas; lode 3 feet wide, worth about 2 dwts. of gold per ton.—West San Benito Mine: The tramway is now complete, and all arrangements made for stoping, which we shall commence at once.—East San Benito Mine: In the cross-cut driving south we have cut the lode, which is fully 17 ft. wide, worth 4 dwts. of gold per ton.—Consuelo Mine: The No. 4 level has been driven east on the course of the lode 2¾ varas; the lode is larger, but of no value. We have also driven a cross-cut north 20 varas, towards the San Pablo lode, which we expect to cut in a few days. In consequence of the natives' feast the stamps has been idle eight days during the month. The number of tons sent to the stamps is as follows:—From San Antonio, 818 tons, yielding 10 9-10 dwts. per ton; from Santo Domingo, 120 tons, yielding 6 dwts. per ton: in all, 938 tons=481·3 ozs. melted gold.

JAVALI.—The directors have received the monthly report from Capt. Johns, dated May 6:—"During April but 7 varas have been driven—3 in the rise at Socorro, and 4 in Pollock's tunnel E. The alterations in the railroad on the surface of Socorro from the cross-cut to Griffin's shaft are now completed. I have built a shed over Griffin's shaft, so that in the rainy season the quartz will not clog, as to our great annoyance it did last year. By the alteration in the railroad I have been enabled to reduce the price of the carriage of quartz to the mill from 45 to 30 cents, which will save in a month about 18*l.*, and I hope next month to get it down even lower than this. In different parts of the mine I have now about 3000 tons broken quartz, and the workmen are engaged bringing it to the mill, where we have now 400 tons. I told you in my last report that the mill was in thorough order, but I found that some part of the blanket-stretchers required to be replaced by new ones, so as to avoid any stoppage during our next grinding season. On the lower part of the stretchers I have put amalgamating copper plates, and have lengthened the launders, which carries the tailings from the mill, adding more riffles, by which additions I hope to effect a saving of mercury. I have also built a shed over our retorting furnace, so that we can retort in any weather. The roof of the mill I have also thought it advisable to re-cover with shingle; this is now half completed, and will last a long time, the new shingles having been put over the old. The contract for charcoal is now finished, and we have sufficient for twelve months. The expenditure for the past month was 310*l.*, the principal items being for shingle and charcoal. As the mail was coming to the coast heavy showers of rain began to fall, so that an early setting in of the wet season may be anticipated. The managing director, Dr. Seemann, will leave by the mail of the 17th inst., and is due at Javali on July 20, taking out with him two additional timbermen. All the new machinery and stores have already been dispatched by a previous mail.

PACIFIC.—H. Prideaux, May 23: Lander Hill Mine: I am now rising in the 550 ft. level to cut the lode under the sump winze. The ground is hard, but I think it will change as it gets nearer the slide. The cross-cuts at the 400 ft. level are progressing favourably. The north cross-cut is driven about 60 ft., the south about 50 ft. I expect to cut a lode in the north cross-cut in about 100 ft. There is no improvement in the lode in the United shaft. The ores that come from this shaft are not rich, but look kindly. I am about to let the stopes above the 400 ft. level on shares or tribute; we can do better by working it on shares than on day's pay. The machinery is working well.

BRAGANZA (Gold).—Captain Roberts, Morro Tabac, May 16: We have continued to drive and rise the several levels in the course of Nos. 1, 2, and 3 lodes, and thus get at them to the best advantage for extracting the stuff, and at the same time providing for the safety of the men employed. The wash-house mentioned in my last is covered in, and washing apparatus fixed, which will enable us to dispatch a greater quantity of sand in much less time, and will greatly economise in the saving of gold. I have two skins washed daily for my inspection, and I am pleased to say this morning the batea showed more gold than at any other time for the month; this sand goes for cleaning up next time. We expect Mr. Richards to arrive at the mine about the 20th.

IMPERIAL OTTOMAN.—Capt. Champion, June 3: We have not yet intersected the lode in the cross-cut, which is now in 4½ fathoms below the shaft; the stratum is a pale blue elvan, with branches of friable spar, which indications are considered favourable for ore. The ground is not dipping so flat, and with present indications we cannot be far from the lode. The stopes continue to yield a small quantity of lead and blende. The winze sinking on No. 1 lode is down 8½ feet below the level; there is no change to remark since my last. The adit is driven 33 fathoms, and the last 4 fathoms has been driven through gossan of a kindly appearance. We have commenced to prepare the blende for market by separating the lead ore from the first washing. I intend to go to Constantinople on Tuesday to ascertain the freight, &c., to Liverpool, and the day the steamer leaves, preparatory to shipping the ore now ready, particulars of which I will inform you by letter.

LUSITANIAN.—Palhal: Basto's Lode: In Taylor's engine-shaft, under the 140, the lode is much easier to break, and is worth 2½ tons per fm. In River's shaft, below the 110, the lode is standing, but as far as can been seen is composed of quartz. The lode in the 140, east of Taylor's, is 7 ft. wide, the north part being worth 2 tons per fathom. The 140 west is suspended for this month, and the men put to rise against No. 85 winze, coming down on this level. In the 130 east the lode is 4 ft. wide, composed of quartz; in the same level west the lode yields about 1 ton per fathom. In the 120 east the lode is 8 ft. wide, made up of quartz and copper ore, and yielding of the latter 1 ton per fathom. The lode in the 110, east of River's shaft, is 3 ft. wide, composed of quartz; the same description applies to the lode at the 90, going in the same direction. In the 70 east the lode is 4½ ft. wide, composed of quartz spotted with lead, worth ½ ton per fathom. In the adit the lode is 8 in. wide, containing a little flookan and quartz.—Mill Lode: The 38, east of Taylor's, contains a lode 2 ft. wide, chiefly schisto. At the 38 west, on the slide lode, the lode is split into small strings, and we have suspended the driving until No. 88 winze is sunk under the 28, to enable us the better to see our position.—Winzes and Rises: No. 85 winze, under the 130, west of Taylor's, contains a lode 3 ft. wide, quartzose. In winze No. 86, under the 90, east of River's, the lode is 6 ft. wide, composed of quartz and mundic. Winze No. 87, east of Taylor's, is holed to the rise above the 140. Winze No. 88, below the 28, east of the cross-cut, west of Perez' shaft, is going down on a branch 8 in. wide, worth ½ ton per fathom.—Carvalhal: The ground is very hard in the 60 cross-cut, north of incline shaft.—Great Lode: The lode is small and unproductive in the 60, east of incline shaft. In the 50, east of ditto, the lode is 1½ ft. wide, composed of quartz and stones of blende; and in the same level west the lode is 2 ft. wide, containing quartz and a little mundic. In the 40 east the lode is 1 ft. wide, chiefly quartz; in the 40 west it is of the same size, and yields stones of mundic. The lode at the 30 east is 3½ ft. wide, yielding good stones of lead. At the 20 east the lode is in a disturbed state, and, consequently, poor.—Caunter Lode: The lode in the adit level, west of incline shaft, is 1½ ft. wide, and produces ¼ ton of blende per fathom. At the 10, in the same direction, the lode is of a similar nature. At the 20 west the lode is 2 ft. wide, yielding ¼ ton per fathom of lead and blende. At the 30 west the lode is 2½ ft. wide, and gives ½ ton of blende per fathom. At the 30, on lode No. 4, the lode is 1½ ft. wide, composed of quartz, with stones of lead, blende, and mundic. The lode in the deep adit level, on north lode, is 2 ft. wide, containing mundic, faced with lead.

[For remainder of Foreign Mines see to-day's Journal.]

MAPS OF MINING DISTRICTS.—We observe in Mr. Spargo's "Guide to British and Foreign Investments" for the present month a very superior wood-cut, illustrative of the Terras mining district, St. Stephen's, Cornwall. Such delineations are useful to mineralogists, miners, and students of the topographical peculiarities of the country; but, above all, to investors, who can in their own study, office, or parlour by this means travel the districts or counties so depicted, and realise their claims. We have also seen a very interesting map of the United States of North America and territories, tinted, marking out with great distinctness and perspicuity all the great mining districts from California, west of the Rocky Mountains, along the vicinities of the course of the Pacific Railroad, through Nevada, Utah, Colorada, Nebraska, &c. Regions the most prolific in metalliferous mines of any countries in the world, not excepting the southern half of the same vast continent. Colorado seems to be the centre of this vast district of metalliferous treasure, and it is so marked on the map. This map was originally drawn by Mr. Whitney, so well known for his exhibition of metals from this region in the great Paris International Exhibition. Mr. Whitney's map is very beautifully executed, and is a fine specimen of orographical drawing. Having presented it to Mr. Spargo, of Gresham House, the latter gentleman is about to publish it in the forthcoming number of his "Guide to Investors." This map is well worth the study of all persons interested in mining.

AMERICAN MINING, AND BRITISH CAPITAL.

As many observations have recently been made, calculated to prejudice the mines of the Pacific States of America in the mind of British capitalists, a few of the facts furnished by so competent an authority as Mr. J. Ross Browne, formerly United States Commissioner of Mining Statistics, cannot fail to be of general interest. In the introduction of American mines upon the English market enormous difficulties have to be overcome, owing to the constant repetition of the question—If the American mines be so profitable, why should the owners of them seek in the English market capital to work them with? but it may be hoped that at least some of these difficulties will be removed by the publication of Mr. Ross Browne's letter, which will be found in the Supplement to this day's Journal, wherein the question is very ably answered. It appears that since 1848 the mines of the Pacific States and territories have yielded $1,400,000,000, of which Great Britain has received about two-thirds. He states that during the past 10 years $50,000,000 a year has been shipped; that in the year 1848 the amount of gold and silver in the United States was $112,000,000, whilst at present it would not exceed, including bullion, $300,000,000; and that nearly all that has been produced has been exported—London, as the commercial centre of the world, receiving 9-10ths of it.

With regard to the losses in American mines, Mr. Ross Browne maintains that the risks have not been borne, nor the losses suffered by, English capitalists since "the whole amount of British capital invested in American gold and silver mines during the past 20 years does not, he is sure, reach 1 per cent. of the product; in fact, the Americans have had very little aid from foreign capital. What has been achieved has been the result of their own labour and energy." In 20 years' experience of mines west of the Rocky Mountains he is not acquainted with half-a-dozen instances in which British capital has been sacrificed by fraud or by lack of value in the mines, and in those cases which have occurred he ventures to assert that the guilty parties do not all reside on the Pacific Coast. He attributes the necessity of bringing American mines on the English market to the difference of the rate of interest ruling in the Pacific States and in England—a mine giving a profit of 3 per cent. per month being unattractive to Californian capitalists, who require at least 5 per cent. per month for their money, although it could be satisfactorily worked by English capitalists, who would regard 36 per cent. per annum as a very fair return for their outlay; and that the Pacific mines do give profits he shows by referring to the mines on the Comstock lode, in Grass Valley, on Gold Hill, and elsewhere—suggesting that, with a few millions sterling, judiciously invested in smelting-works, and the development of properties of demonstrated value, the products of their mineral regions might be doubled within a few years, and he knows of no investment likely to pay better; and of no country that would profit more directly by the increase than Great Britain.

Amongst American mining properties recently offered to the notice of British capitalists the AJAX (BIG INDIAN) SILVER MINING COMPANY, which has been formed with a capital of 40,000*l.*, in shares of 5*l.* each, for working the Big Indian Lode Mine, on Clear Creek, Colorado, claims special advantages, inasmuch as it is within 600 yards of smelting-works in Georgetown, whilst many of the mines in the district, already in profitable working, have three miles carriage from the mines to the reduction works, with the further advantages that the proprietors of the reduction works have recently lowered their charges, and that the railway to Georgetown will be completed in about eighteen months. The riches of the district are well known, and it is remarked that as regards the present enterprise it is only necessary to point out that the property consists of a rich mineral lode deposited in a true fissure, and is thus practically inexhaustible, instead of being a mere series of pockets, the supply of ore from which would soon be worked out. The terms of purchase (20,000*l.*) are extremely reasonable, and form a very striking contrast to the prices asked by the vendors of other properties neither more favourably situated nor more developed—three-fourths only of the capital, or 6000 shares, will be first issued, 2000 of which, fully paid, are to be handed to the vendors in part payment of the purchase-money, the remainder of which is to be paid in cash. The purchase is made contingent upon the confirmation of a highly favourable report upon the property by Mr. F. F. Brunè, formerly deputy United States Surveyor-in-General of the Colorado district, such confirmation to be obtained from an engineer selected by the company and sent out at the expense of the vendor. Mr. Brunè thinks 6 tons of ore per day can at once be extracted from the mines, averaging 84 ozs. to the ton, which would leave a net profit of 15,000*l.* per annum, at the same time opening the mine for further development, which will, of course, considerably increase the returns. The direction is a highly respectable one, and is composed of gentlemen in whom the fullest confidence may be placed.

COPPER ORES.

Sampled May 24, and sold at Swansea, June 13.

Mines.	Tons.	Produce.	Price.	Mines.	Tons.	Produce.	Price.
Cape Ore....	50	31½..	£20 11 6	Lisbon	6	23⅞..	£15 10 0
ditto.....	50	31½....	20 11 6	ditto.....	19	23¼....	15 13 0
ditto.....	48	31½....	20 11 6	ditto.....	10	22⅞....	15 8 0
ditto.....	21	34½....	23 2 6	Paramatta..	44	16	10 16 0
ditto.....	13	34½....	23 2 6	ditto.....	43	16½....	10 16 0
ditto.....	50	34½....	23 4 0	ditto.....	42	16½....	10 16 0
ditto.....	50	34½....	23 2 6	ditto.....	37	16½....	10 16 0
ditto.....	50	34½....	23 5 6	Brass Ashes.	74	5⅜....	2 14 0
ditto.....	49	32	21 11 0	ditto.....	73	6	2 13 0
ditto.....	48	32½....	21 15 0	Cuba Dust ..	49	11½....	7 12 6
Knockmahon	116	8½....	5 4 6	ditto.....	48	11⅝....	7 12 6
ditto.....	110	6⅜....	4 1 0	ditto.....	23	53¼....	35 1 0
ditto.....	100	8	5 3 0	ditto.....	22	52	34 5 6
ditto.....	95	8½....	5 8 6	ditto.....	22	12⅜....	7 9 0
Berehaven..	133	7⅜....	4 18 0	ditto.....	15	70⅛....	45 14 0
ditto.....	70	8⅛....	5 4 0	ditto.....	15	12⅜....	8 5 0
ditto.....	73	8¼....	5 4 0	Australian..	58	14⅞....	9 1 6
ditto.....	136	6⅜....	4 2 0	ditto.....	47	14	9 3 0
Moonta	99	17½....	11 13 0	Copper Ore..	6	4¼....	1 13 0
ditto.....	99	17¼....	11 13 0	Copper Reg..	4	33¼....	21 0 0
Lisbon	51	24⅜....	16 15 6	Sweepings ..	2	4⅜....	1 8 0
ditto.....	12	33⅜....	22 12 6	Mixture	172	9¼....	5 12 6
ditto.....	60	23½....	15 18 6	ditto.....	26	6½....	3 1 0

TOTAL PRODUCE.

Cape Ore	429	£9411	6 0	Cuba Dust	94	£3272 19 6
Knockmahon	421	2081	19 6	Australian	105	956 8 0
Berehaven	322	1952	18 0	Copper Ore	6	9 18 0
Moonta.....	198	2306	14 0	Copper Regulus..	4	84 0 0
Lisbon	158	2626	7 6	Sweepings	2	2 16 0
Paramatta	166	1792	16 0	Mixture	198	1046 16 0
Brass Ashes	147	393	5 0			

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
P. Grenfell and Sons	238½	3289 19 0
Sims, Willyams, and Co.	437	4678 14 6
Vivian and Sons	182½	1845 6 0
Williams, Foster, and Co.	658	7314 8 3
Mason and Elkington	559½	5737 12 3
Charles Lambert	114½	674 10 3
Sweetland, Tuttie, and Co.	250	2397 13 3
Total.....	2440	£25,938 3 6

Copper ores for sale June 27.—Cape 45, 44, 44, 2, 50, 50, 50, 11, 50, 49, 28, 51, 64, 21, 5—Berehaven 80, 79, 120, 71, 75—Knockmahon 90, 94, 119, 84—Paramatta 65, 63, 46, 45—Copper Ore 14, 16, 32—Copper Regulus 24—Micheli's Ore 63—Copper Regulus 27, 6—Knockmahon 129, 124—Total, 2040 tons.

TOTALS AND AVERAGES.

	21 cwts.	Produce.	Price.	Per unit.	Standard.
Whole sale..	2440	16½ ..	£10 12 7	13s. 2d.	£ 87 19 6

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